

FIG. 1

		DP1	DP2	DP3
		FR1	X	X
		FR2	X	X
		FR3	X	X
UNCOUPLED - Desired		DP1	DP2	DP3
		X	O	O
		FR1	O	O
		FR2	X	X
		FR3	X	X
DECOUPLED - Acceptable		DP1	DP2	DP3
		X	O	O
		FR1	X	X
		FR2	X	X
		FR3	X	X
COUPLED - Undesired		DP1	DP2	DP3
		X	X	X
		FR1	X	X
		FR2	X	X
		FR3	X	X

FIG. 2

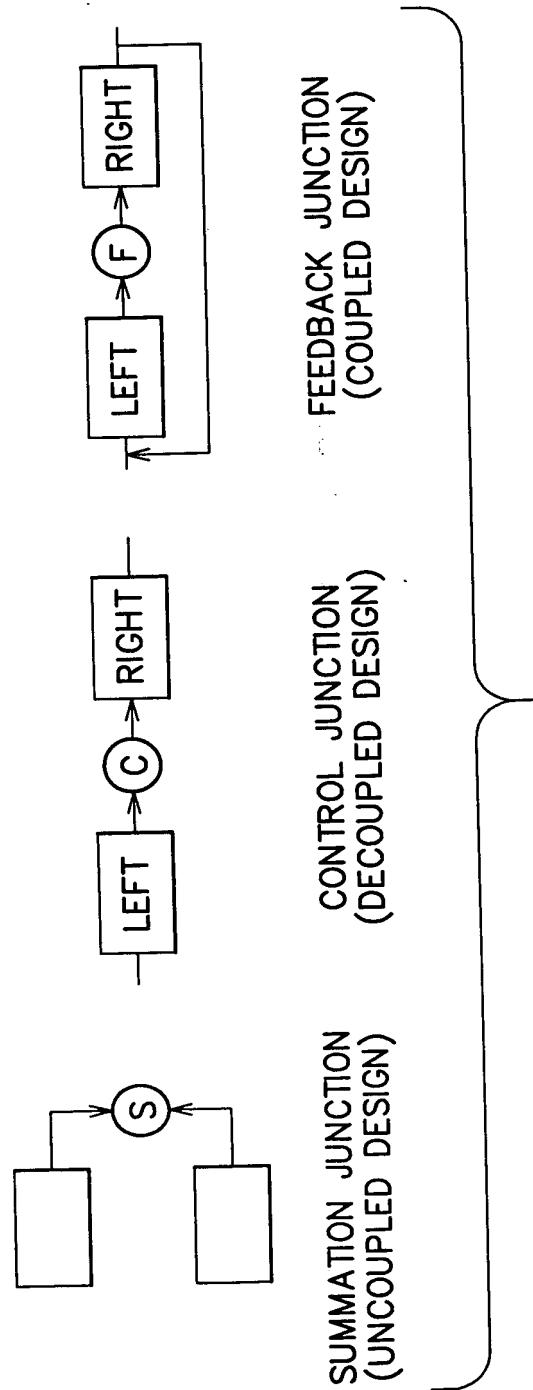


FIG. 3

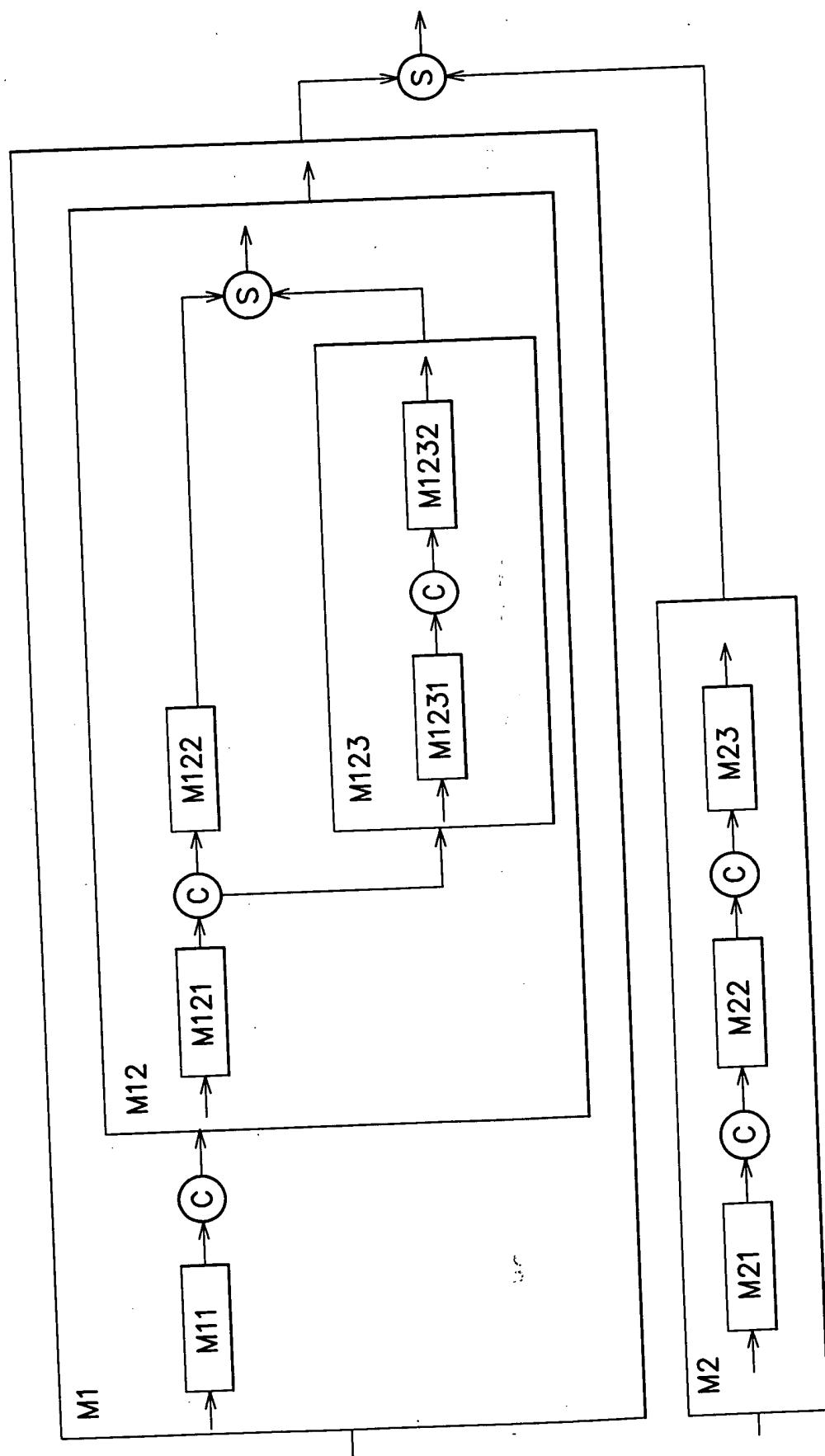


FIG. 4

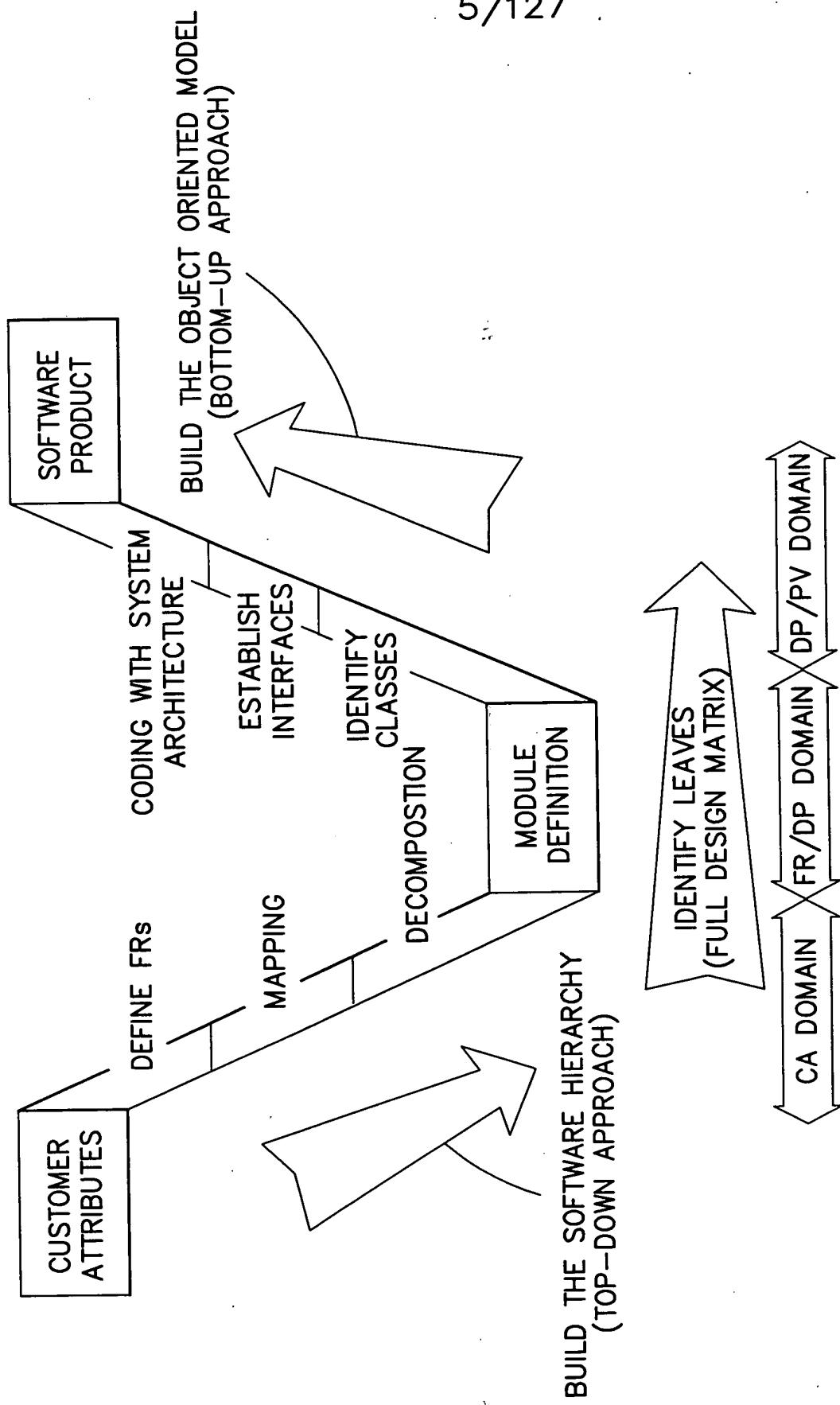


FIG. 5

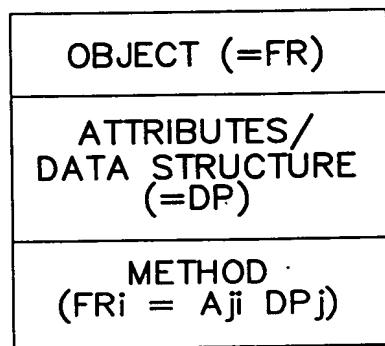


FIG. 6

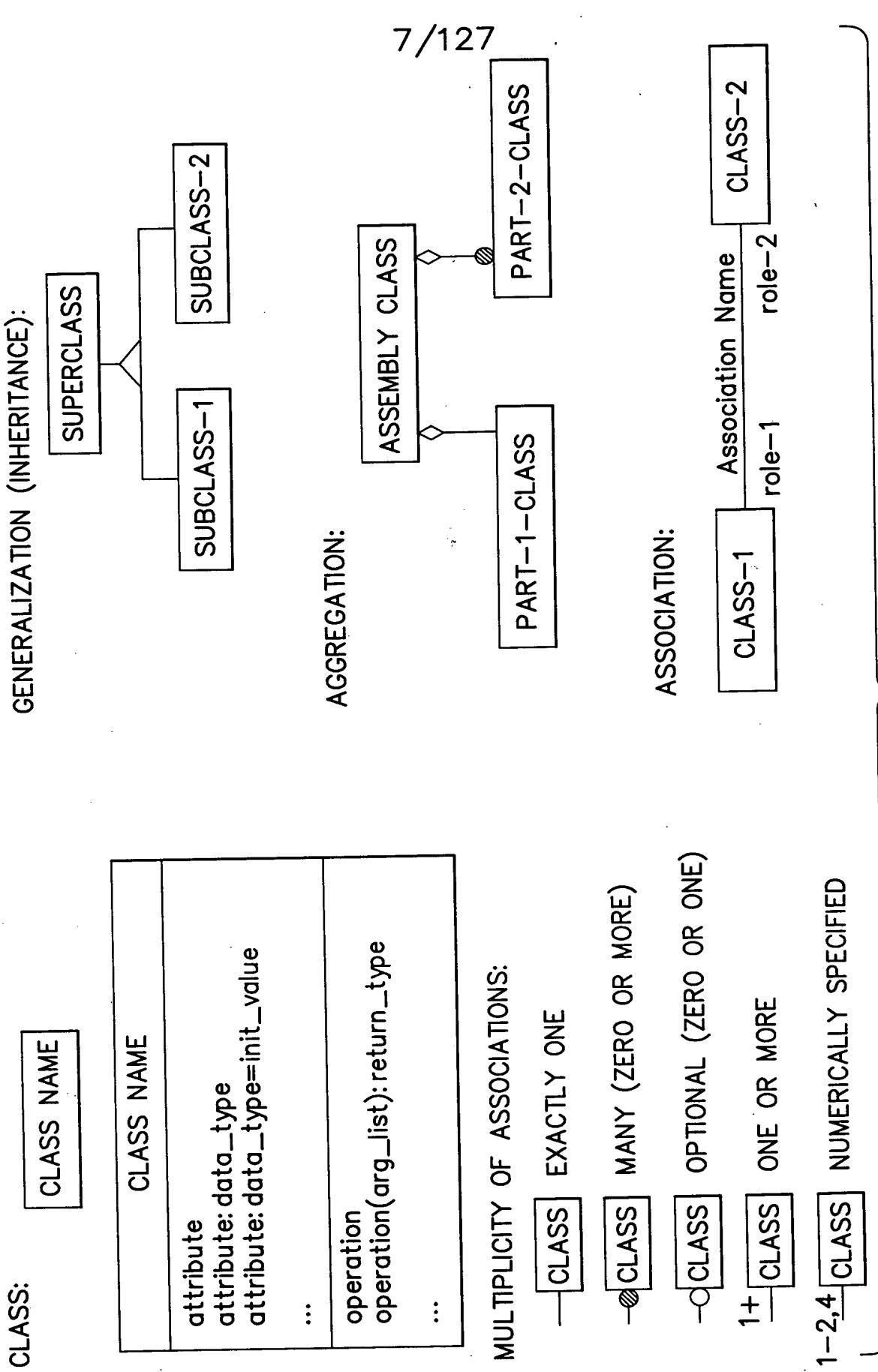


FIG. 7

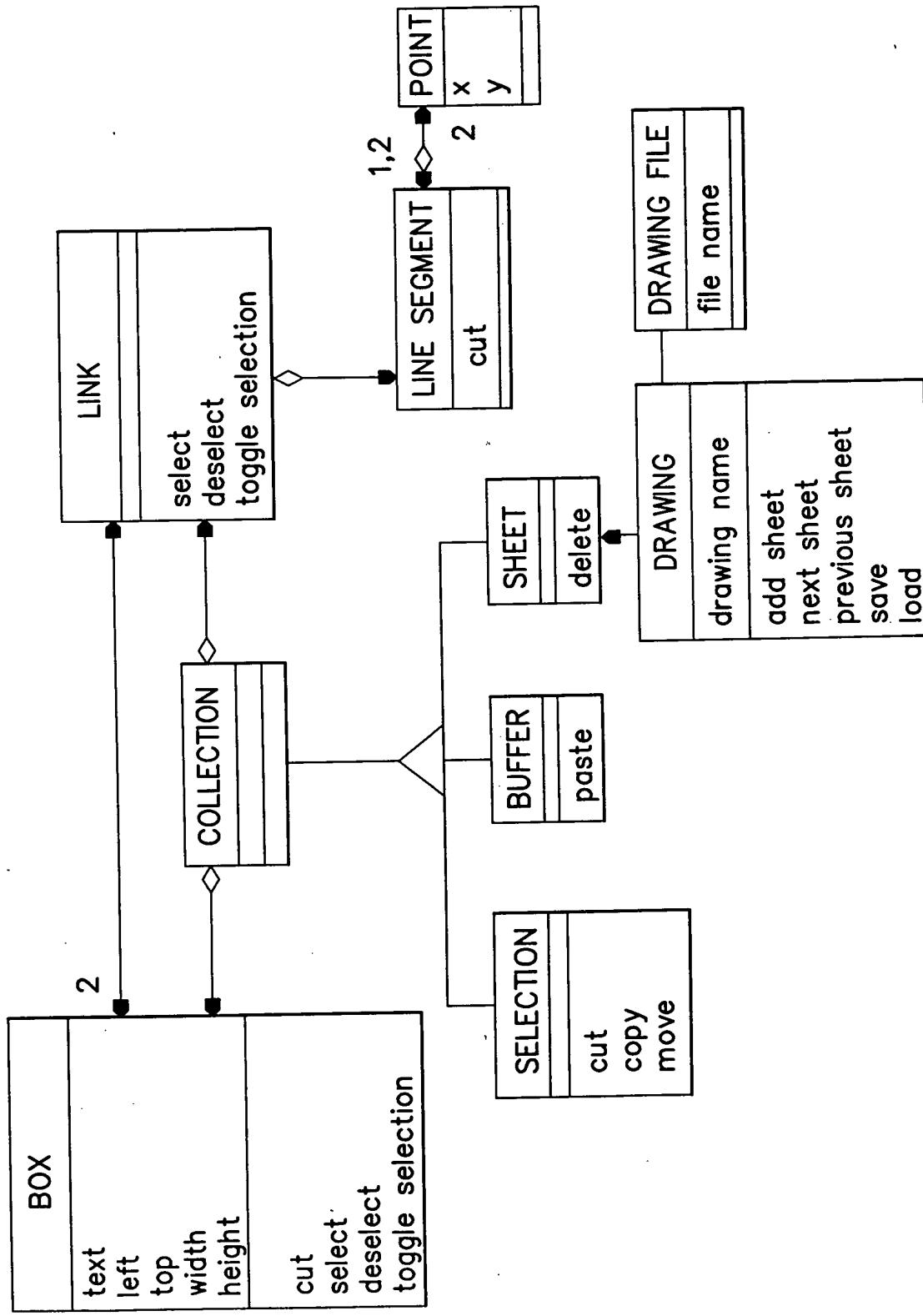
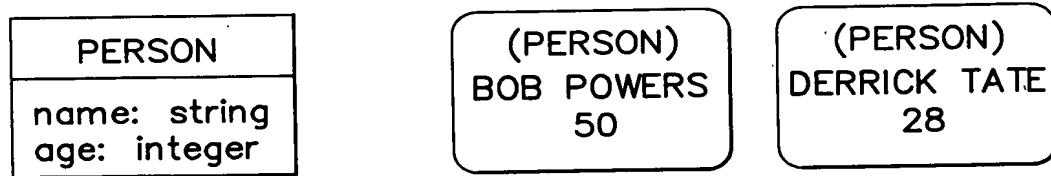


FIG. 8



CLASS DIAGRAM

INSTANCE DIAGRAM

FIG. 9

TOP SECRET//SI//REL TO USA, UK, FVEY

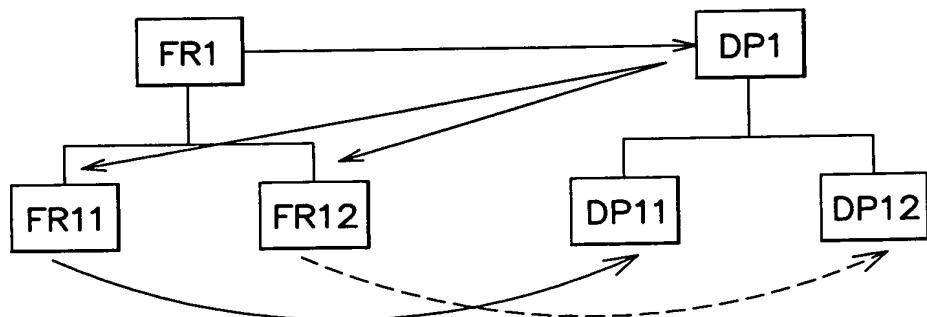


FIG. 10

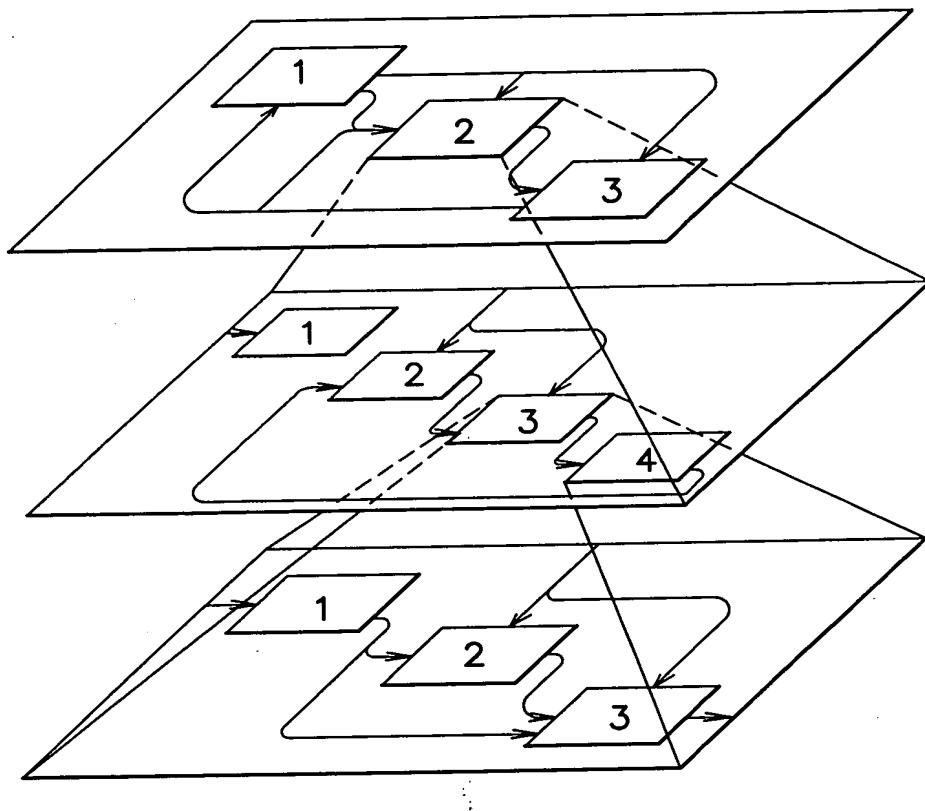


FIG. 11

$$\left\{ \begin{array}{l} \text{FR1: Define Component} \\ \text{FR2: Set Something} \\ \text{FR3: Do Something} \end{array} \right\} = \begin{bmatrix} x & 0 & 0 \\ x & x & 0 \\ x & x & x \end{bmatrix} \left\{ \begin{array}{l} \text{DP1: Attributes} \\ \text{DP2: Action A} \\ \text{DP3: Action B} \end{array} \right\}$$

Module
Definition

The number of total
attributes are 4 for this class.

These two attributes are
used by all methods.

	DP1: Attributes	DP2: Action A	DP3: Action B		
FR1: Define component	uPortPinsUp, uPinsUpSensor				
FR2: Set something	uStatus	SetState()		Module for FR2	
FR3: Do something	uTime	X	ProcessLoop()		Module for FR3

This attribute is only used
by SetState() method.

ProcessLoop() method calls
SetState() method.

FIG. 12

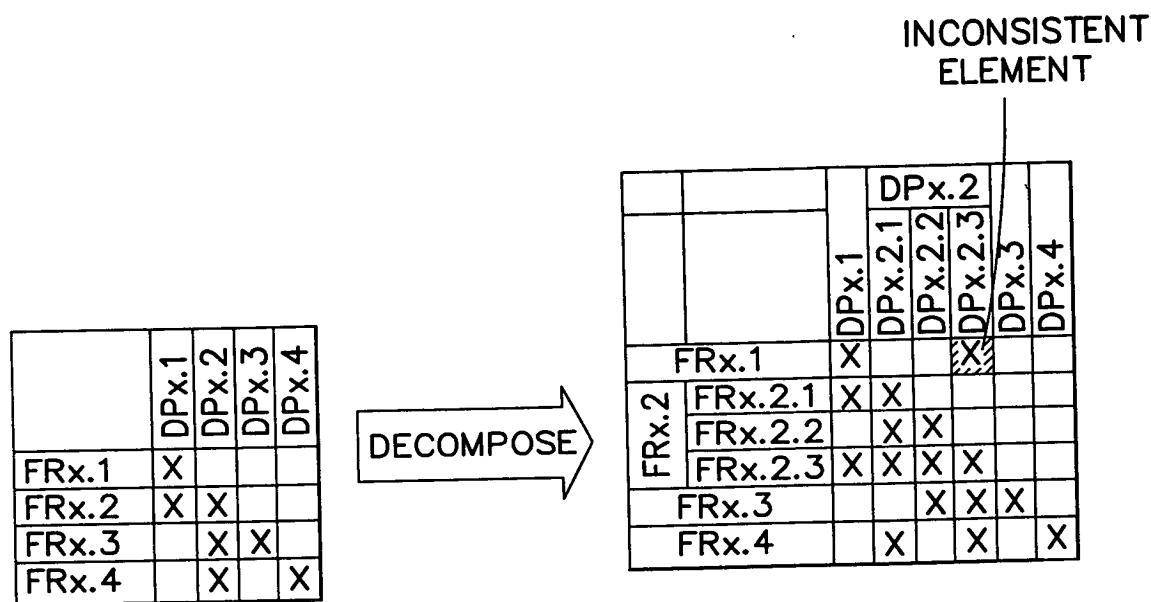


FIG. 13

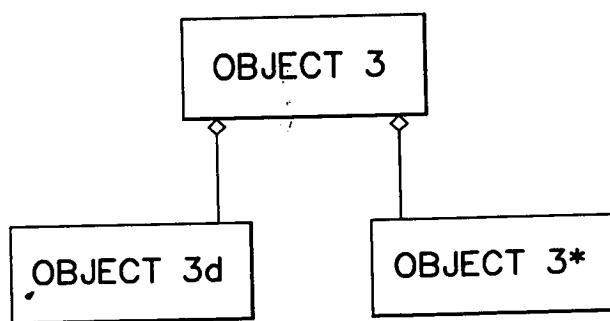


FIG. 14

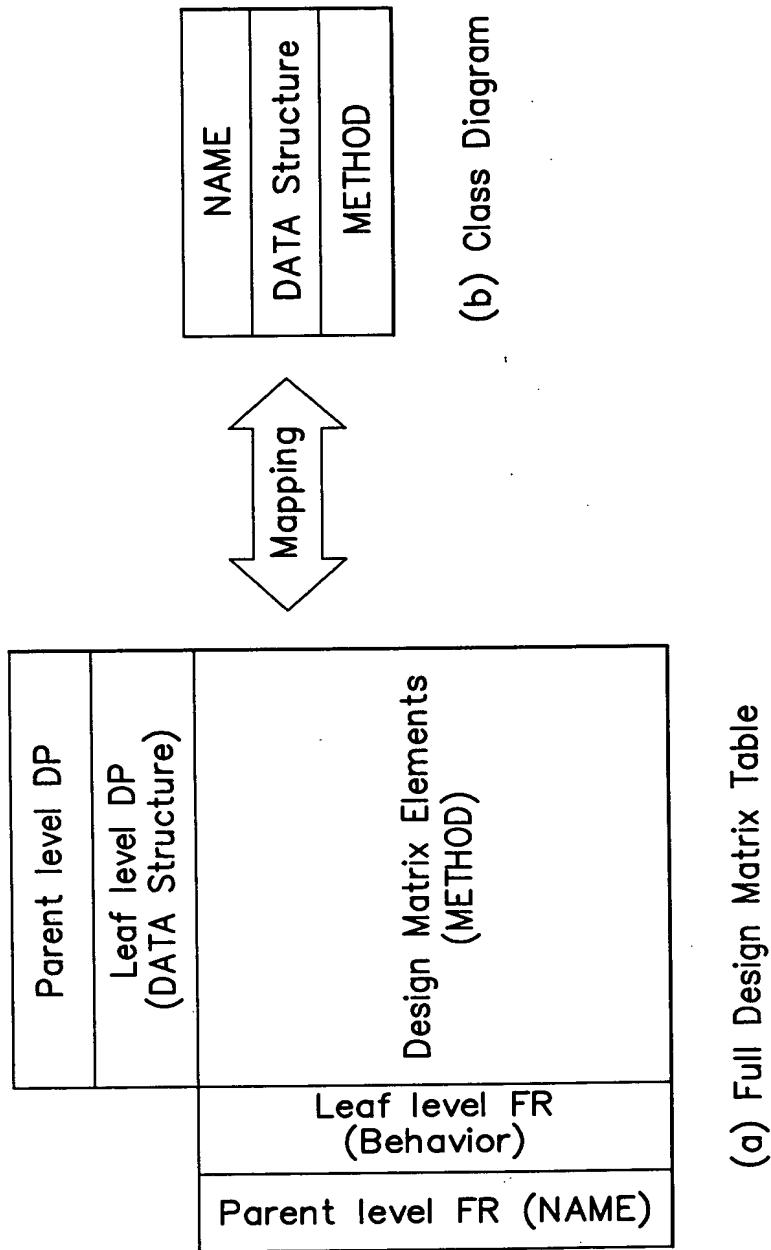


FIG. 15

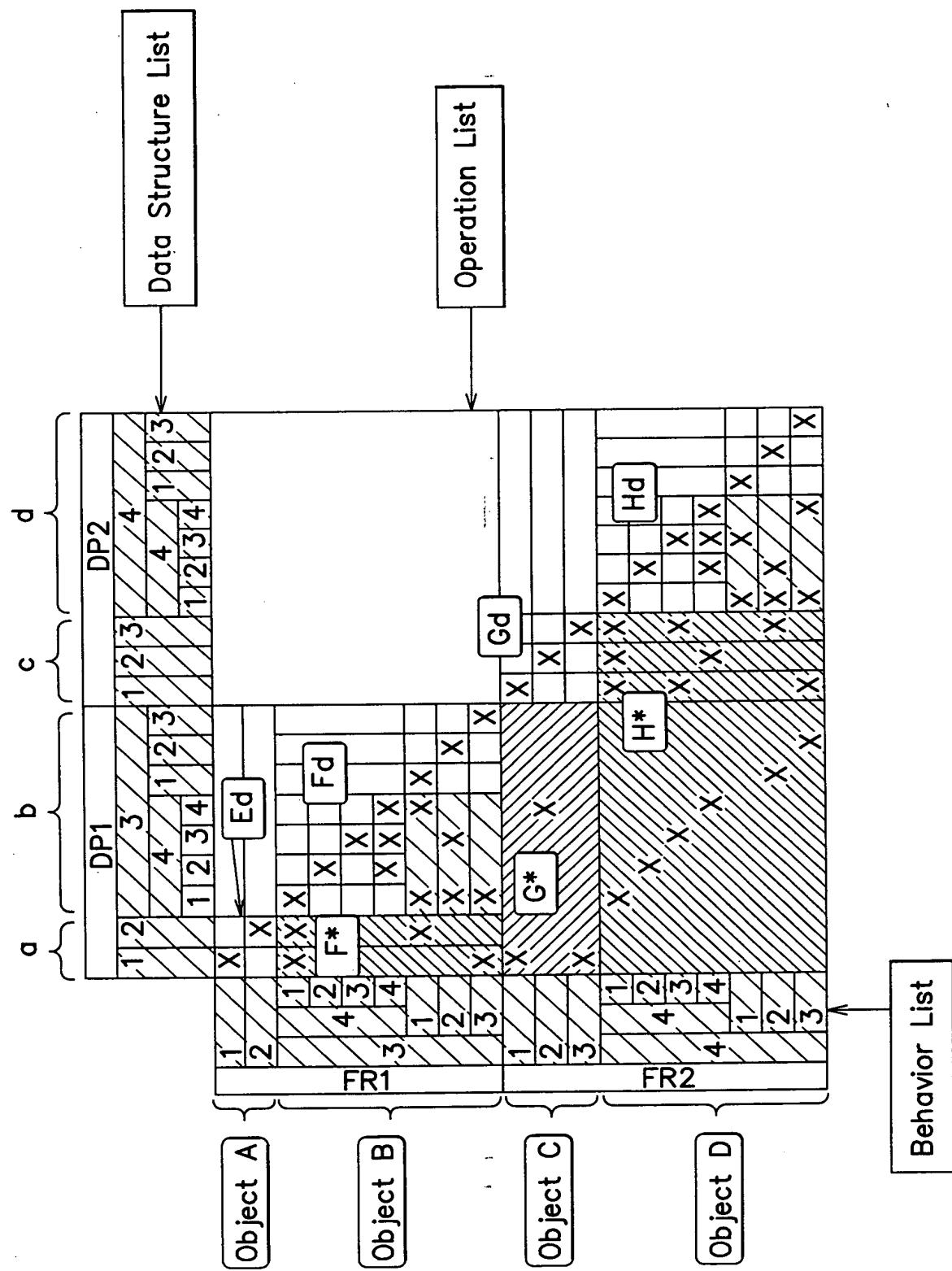


FIG. 16

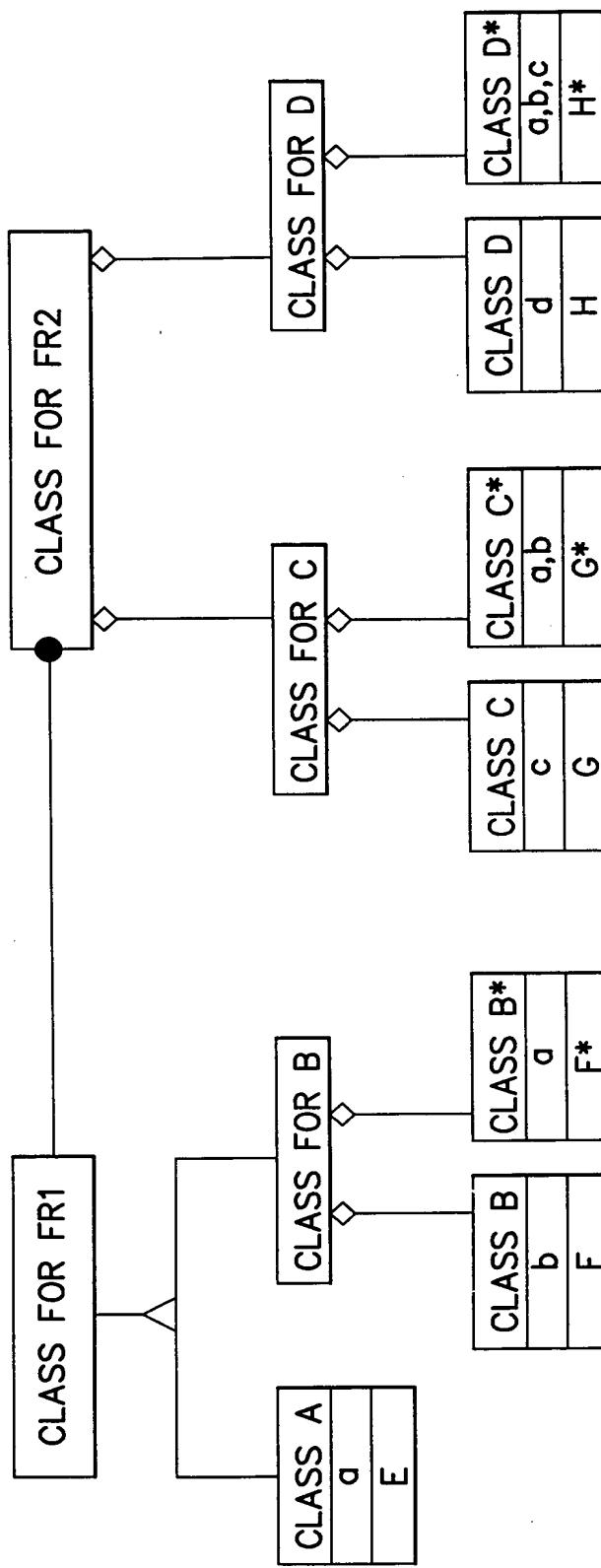


FIG. 17

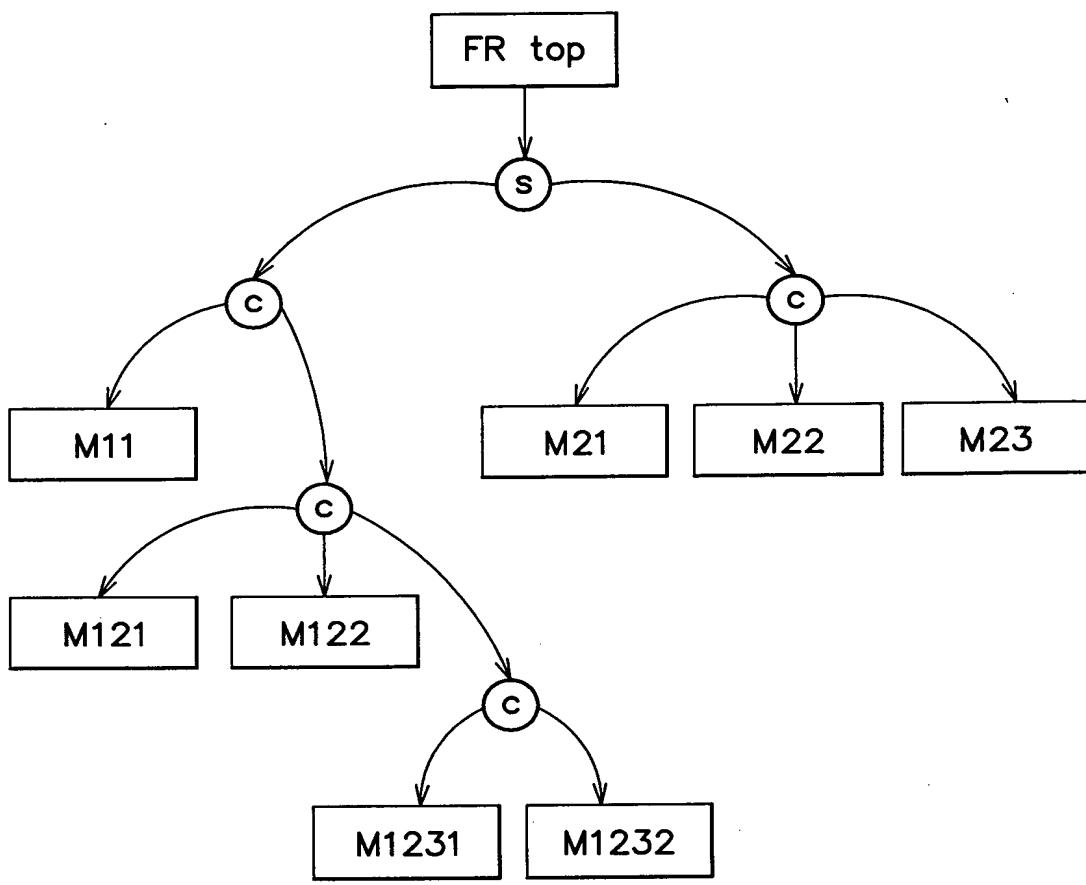


FIG. 18

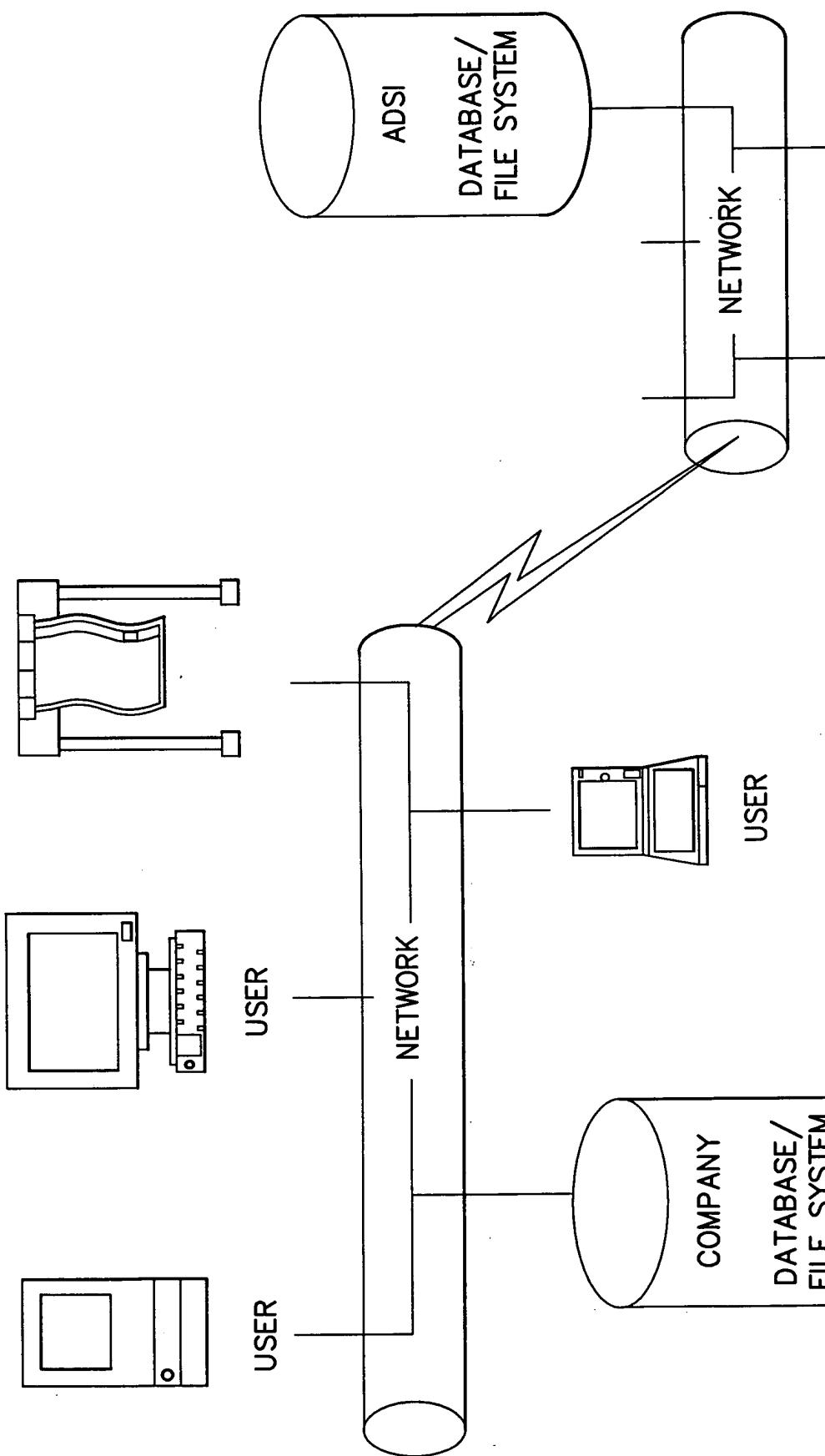


FIG. 19

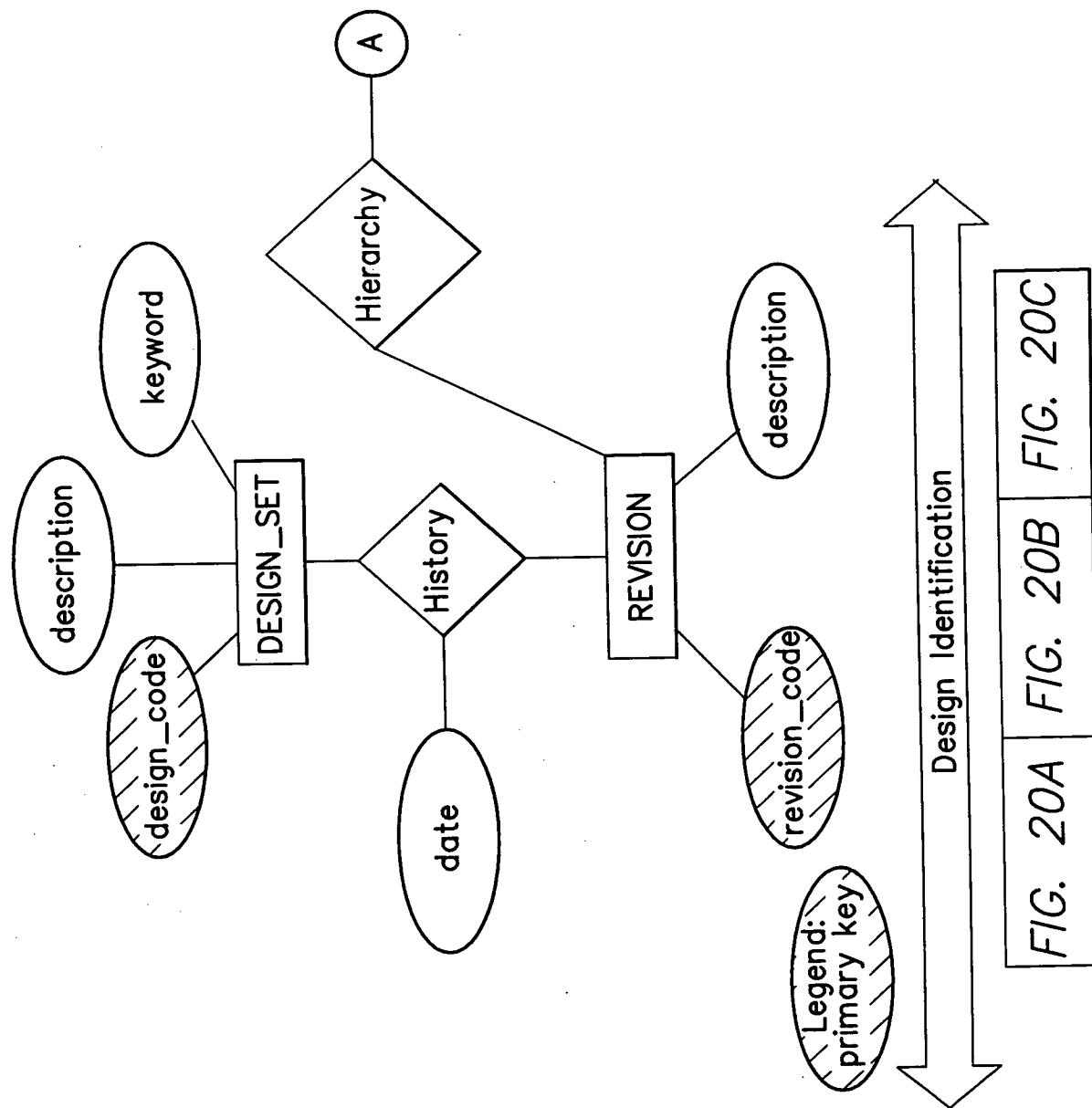


FIG. 20A

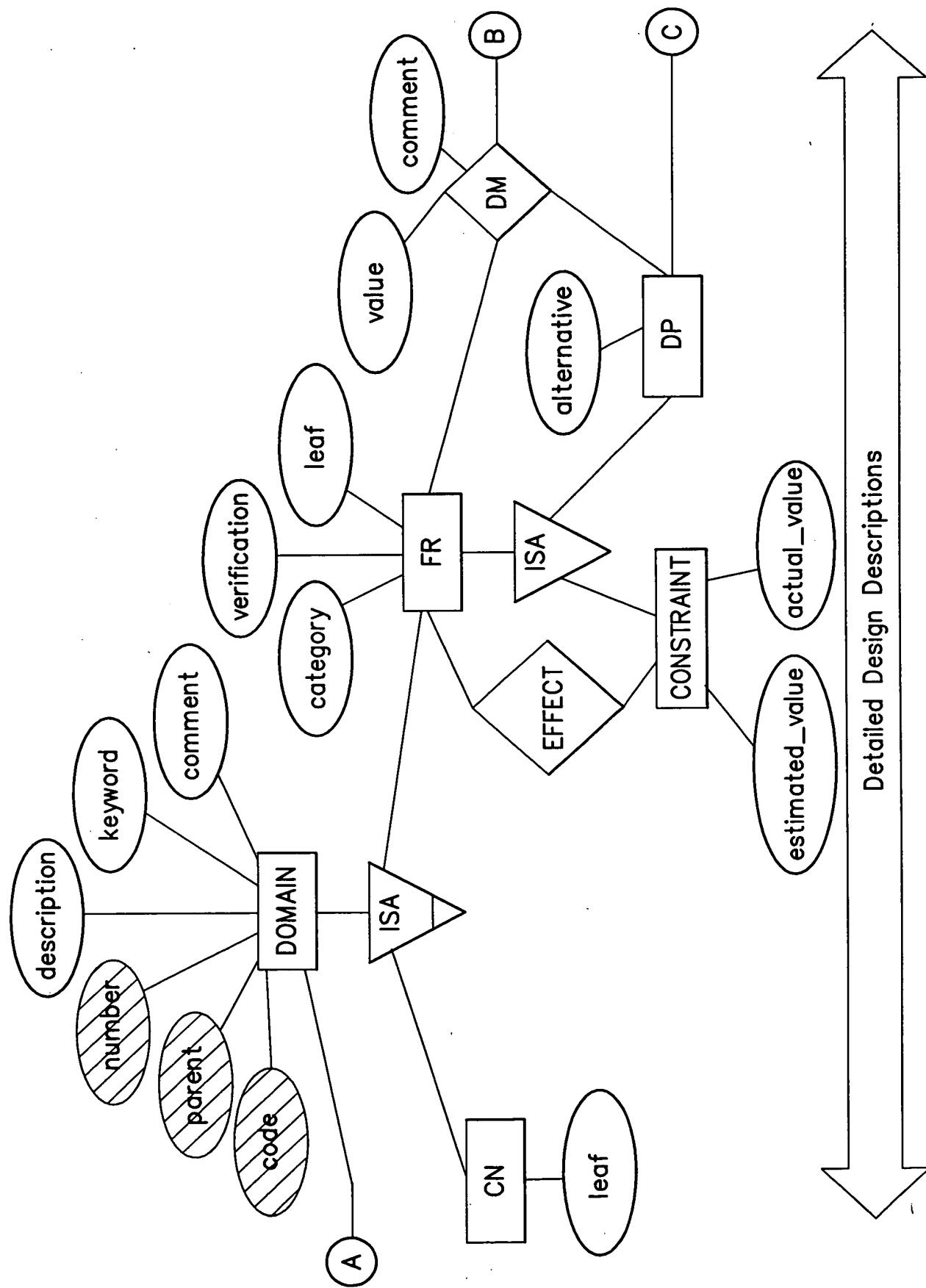


FIG. 20B

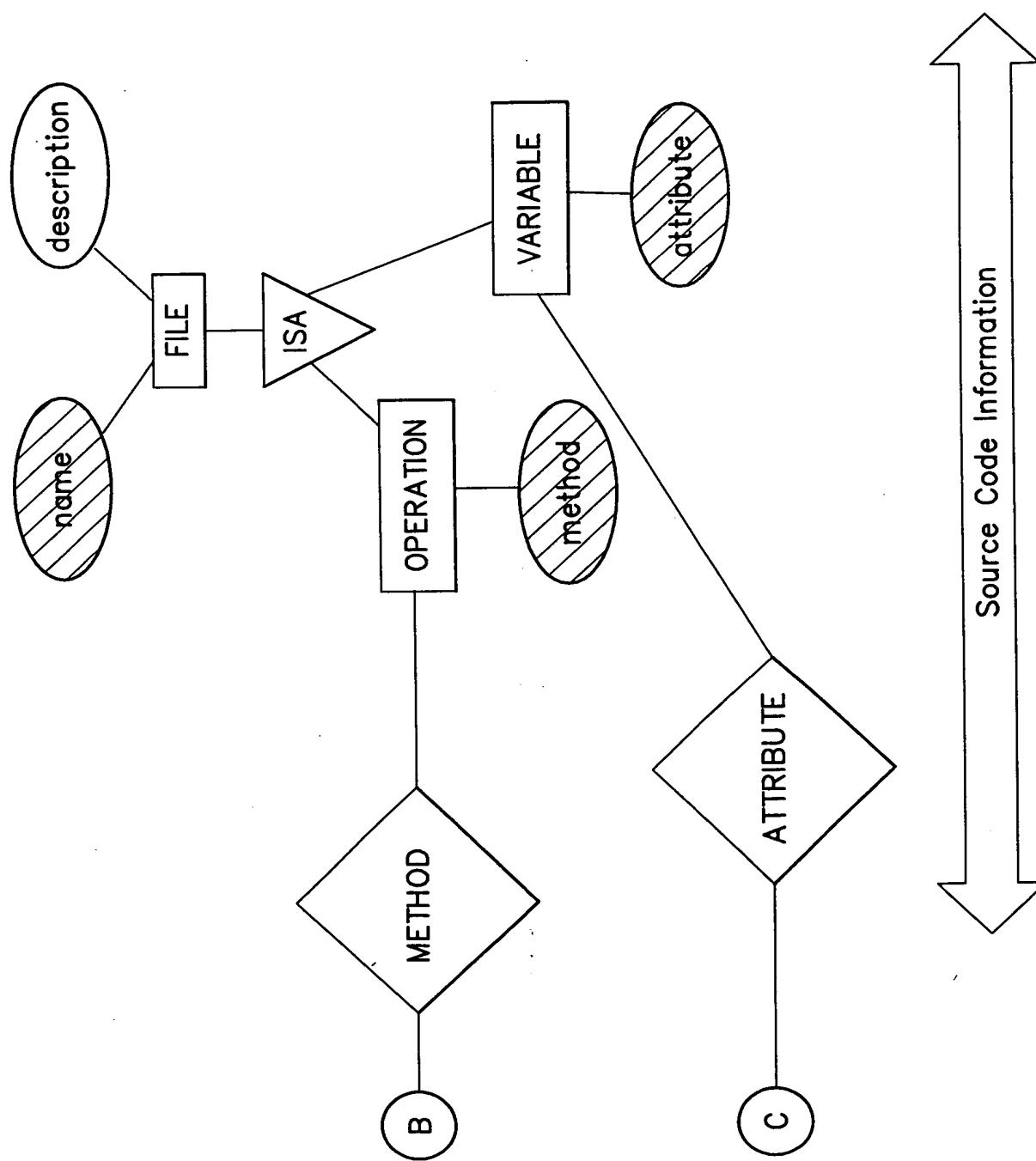
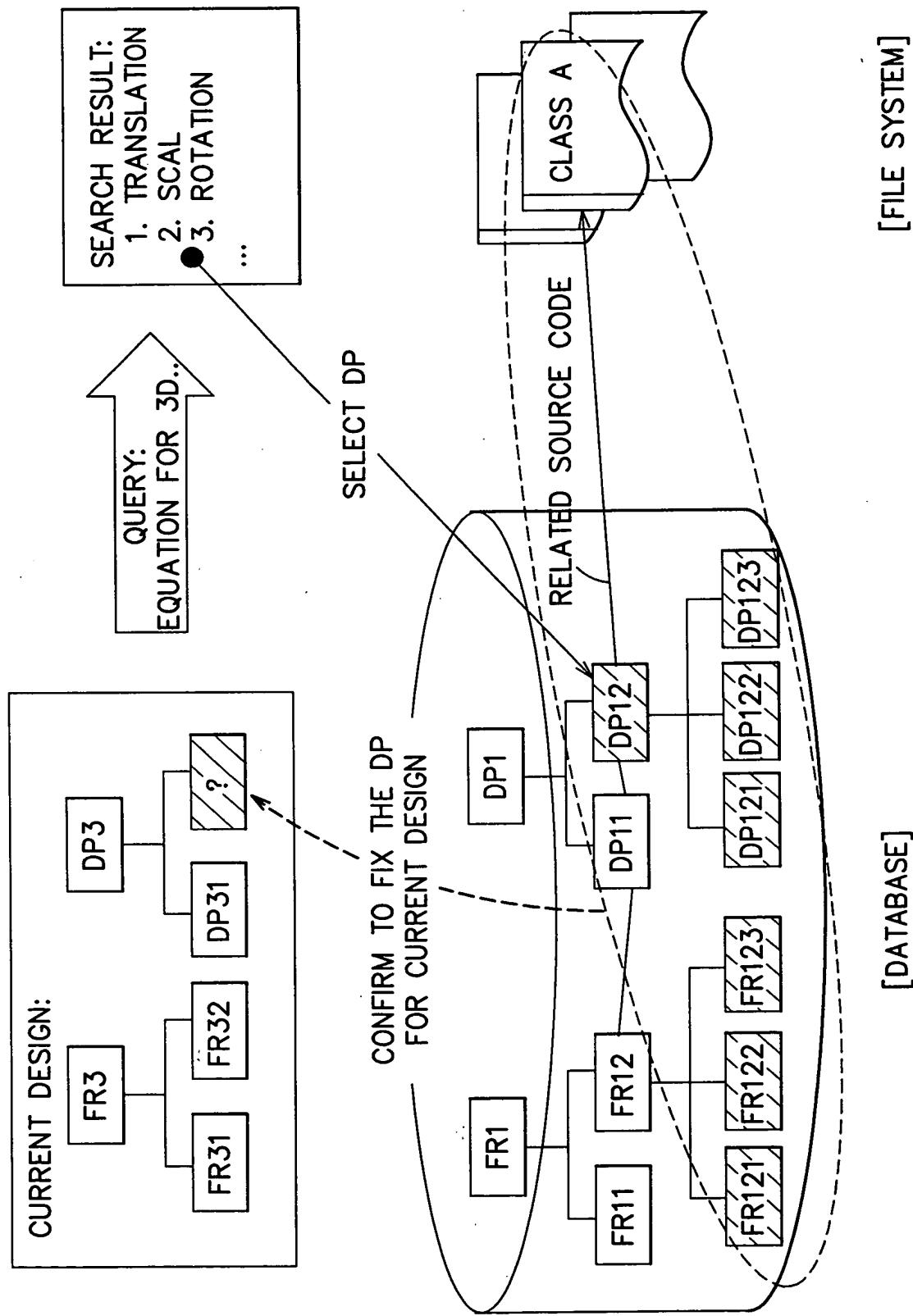


FIG. 20C



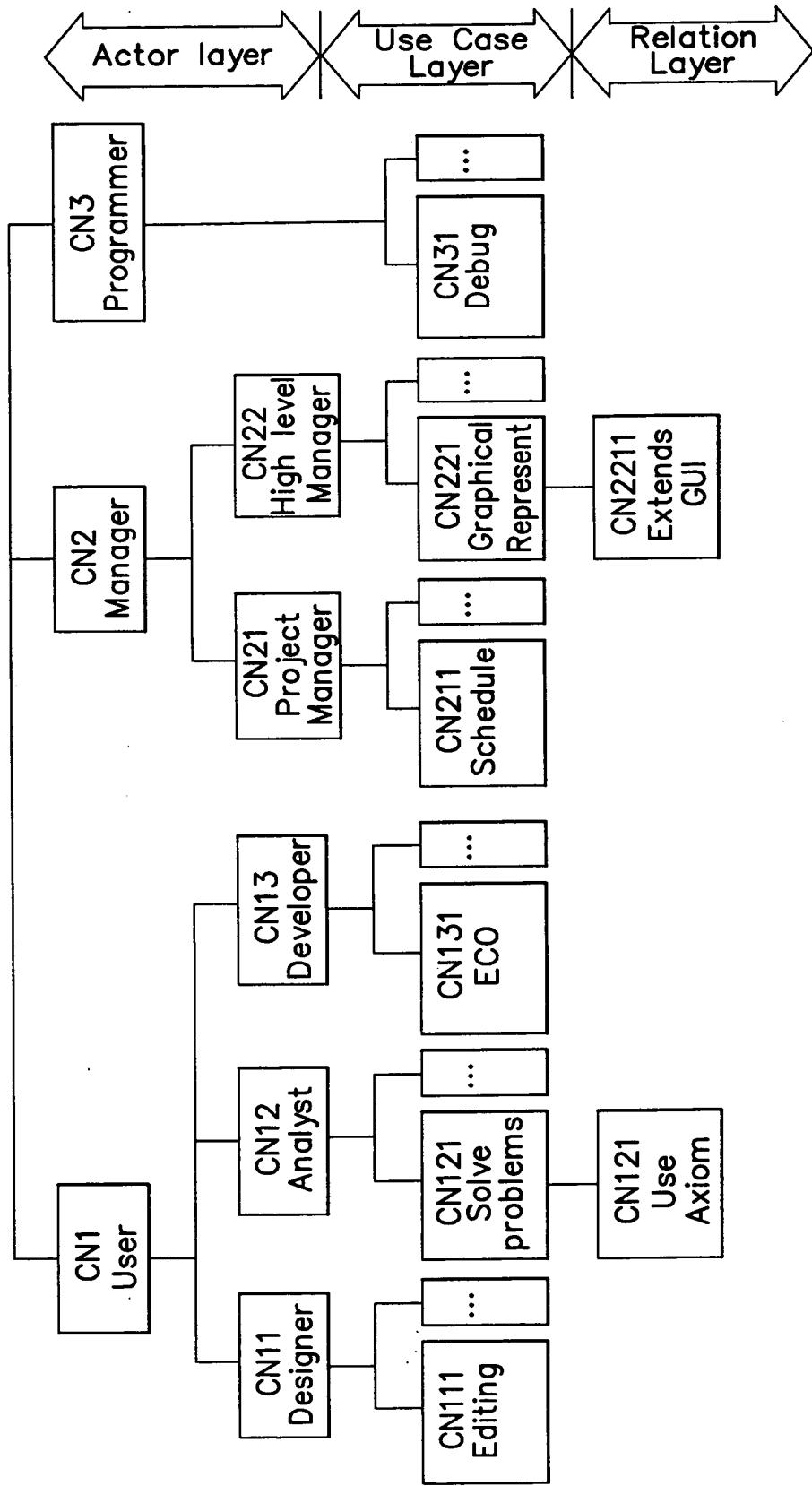


FIG. 22

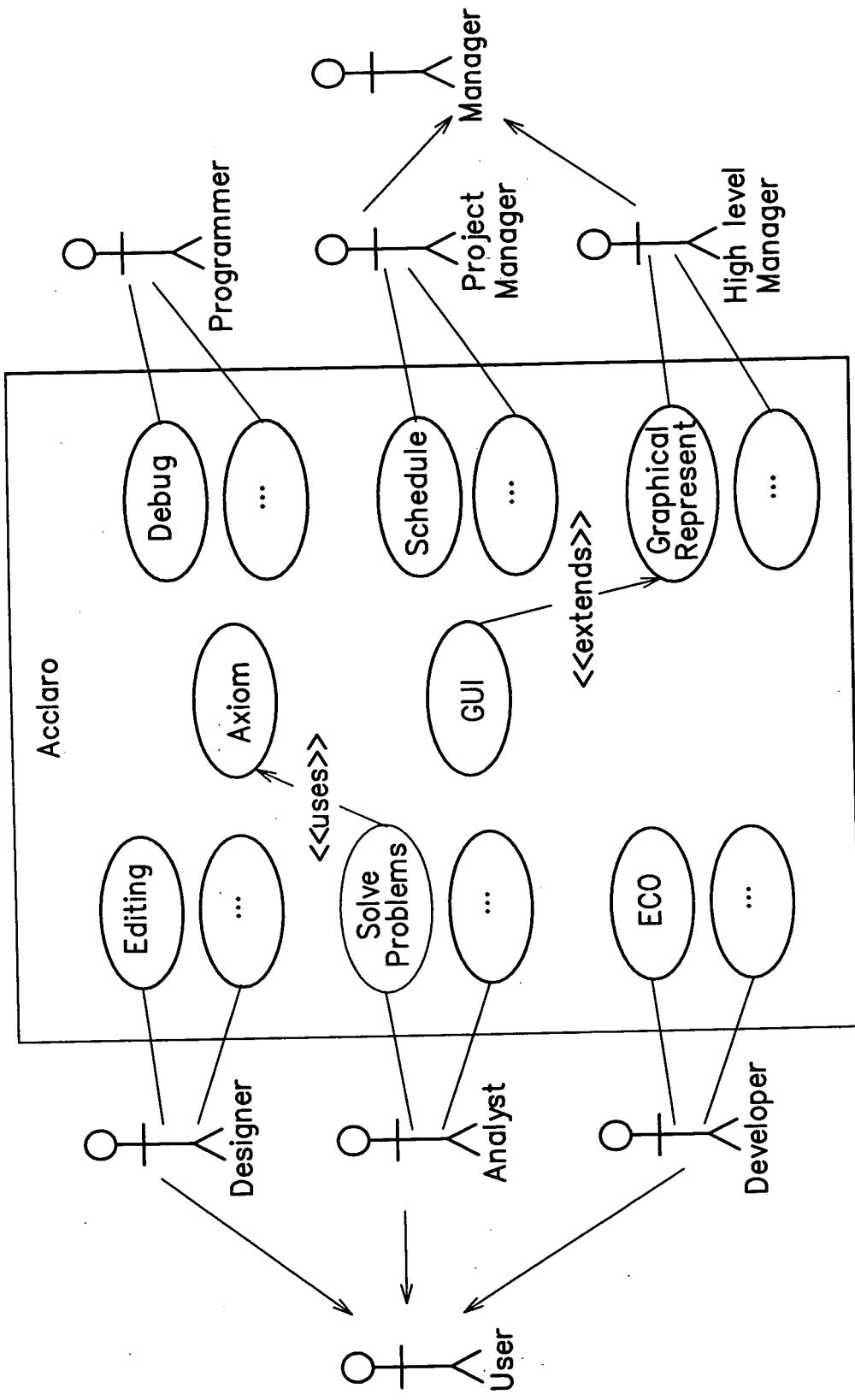


FIG. 23

24/127

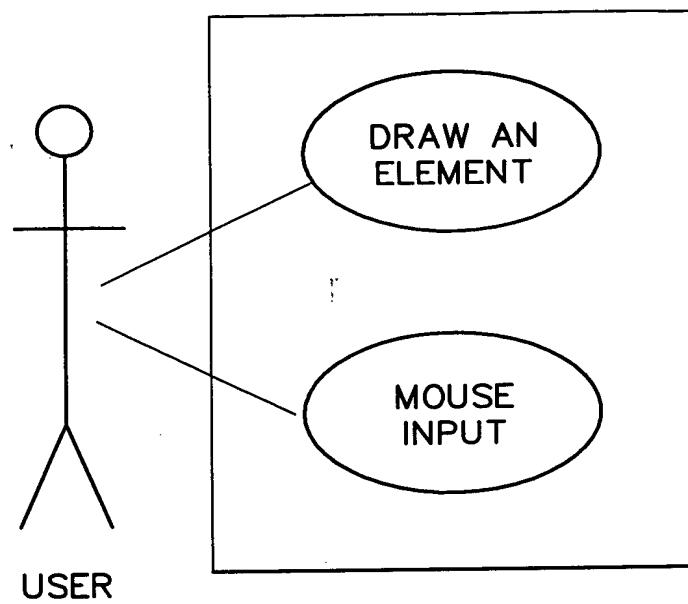


FIG. 24

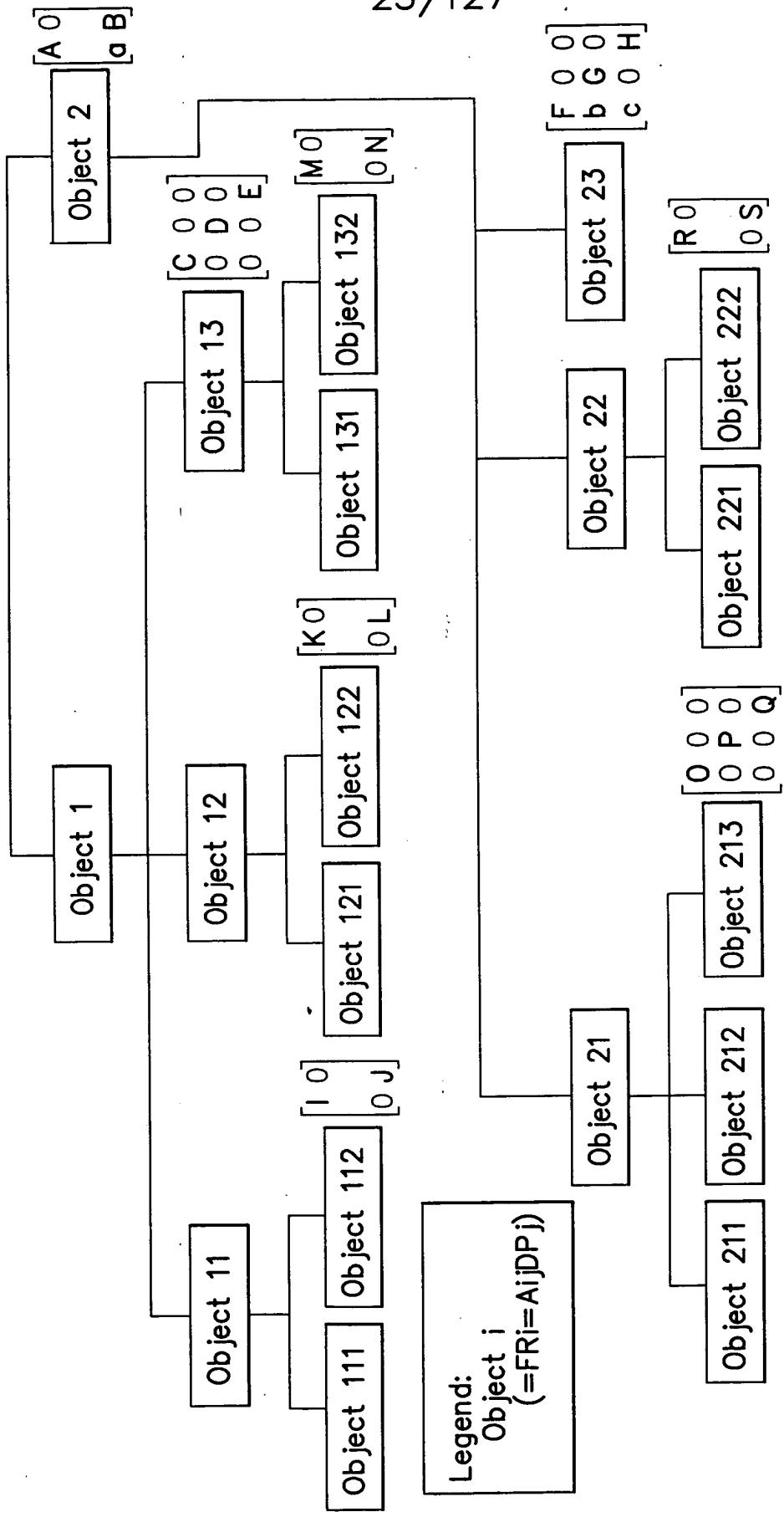


FIG. 25

FIG. 26

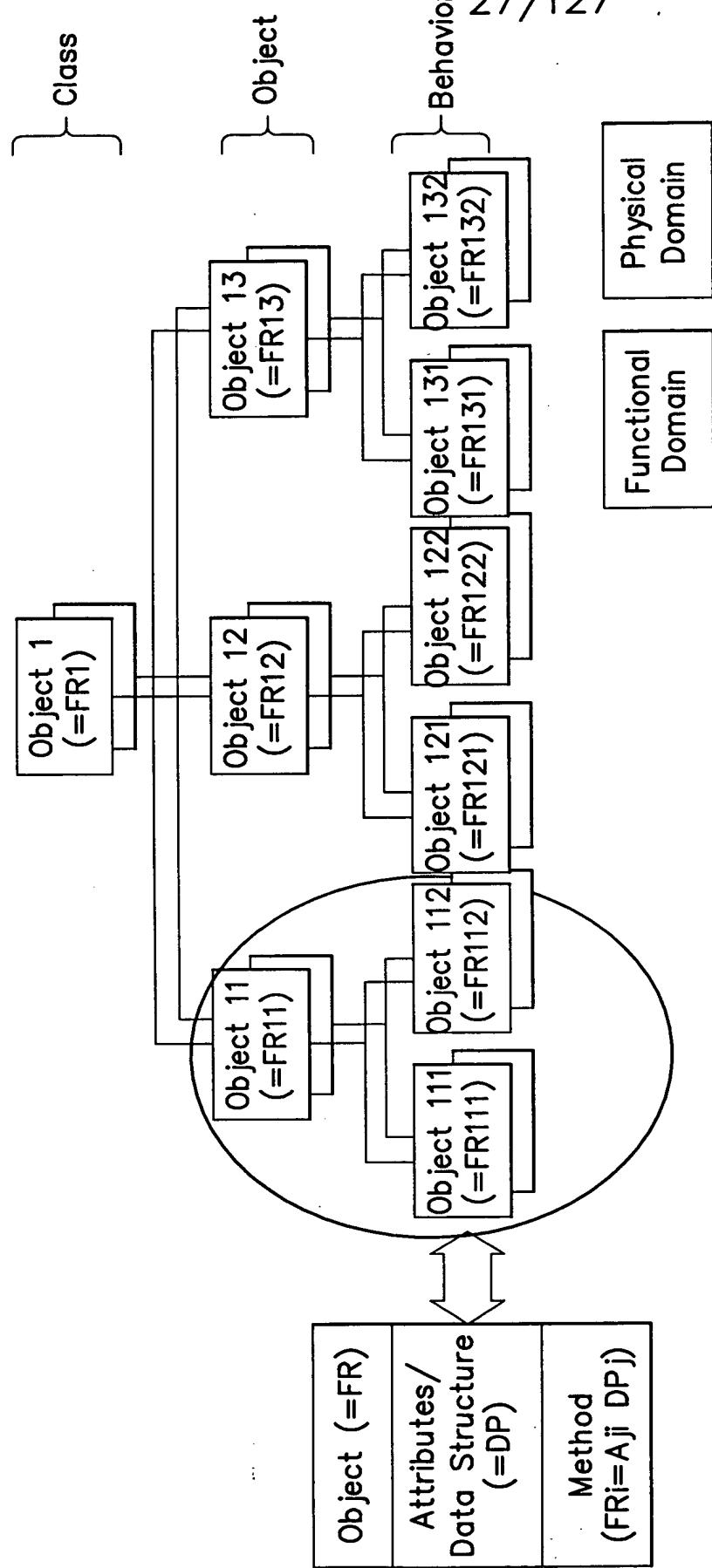


FIG. 27

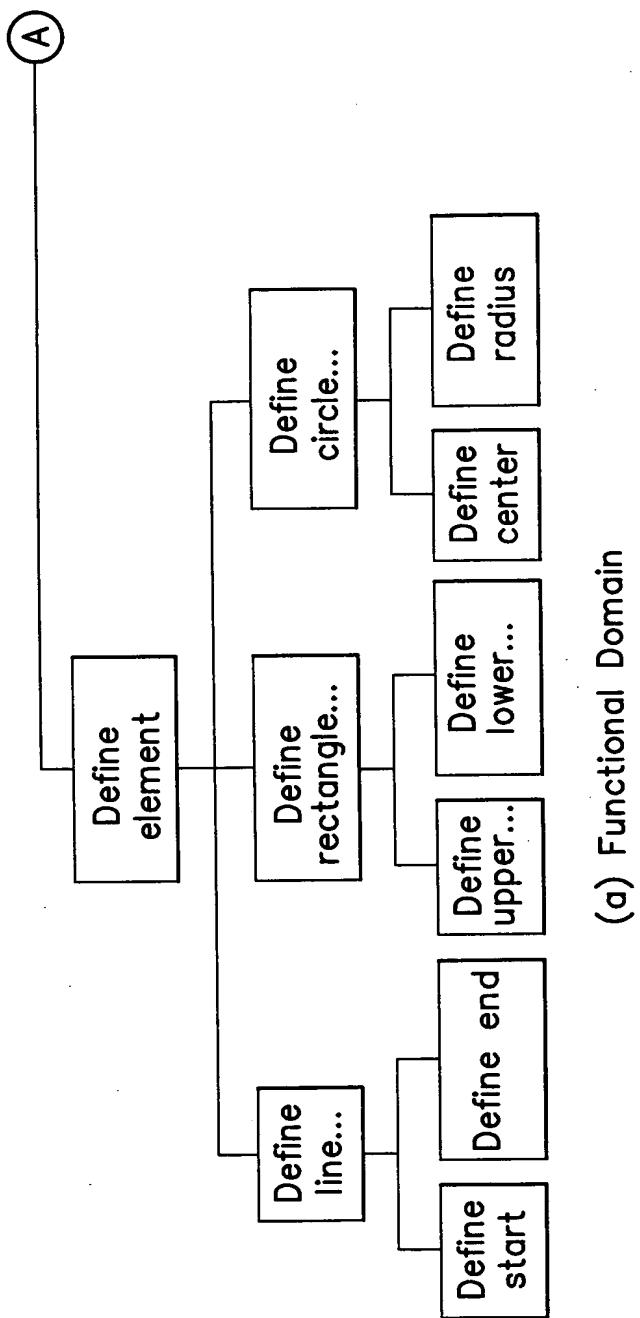
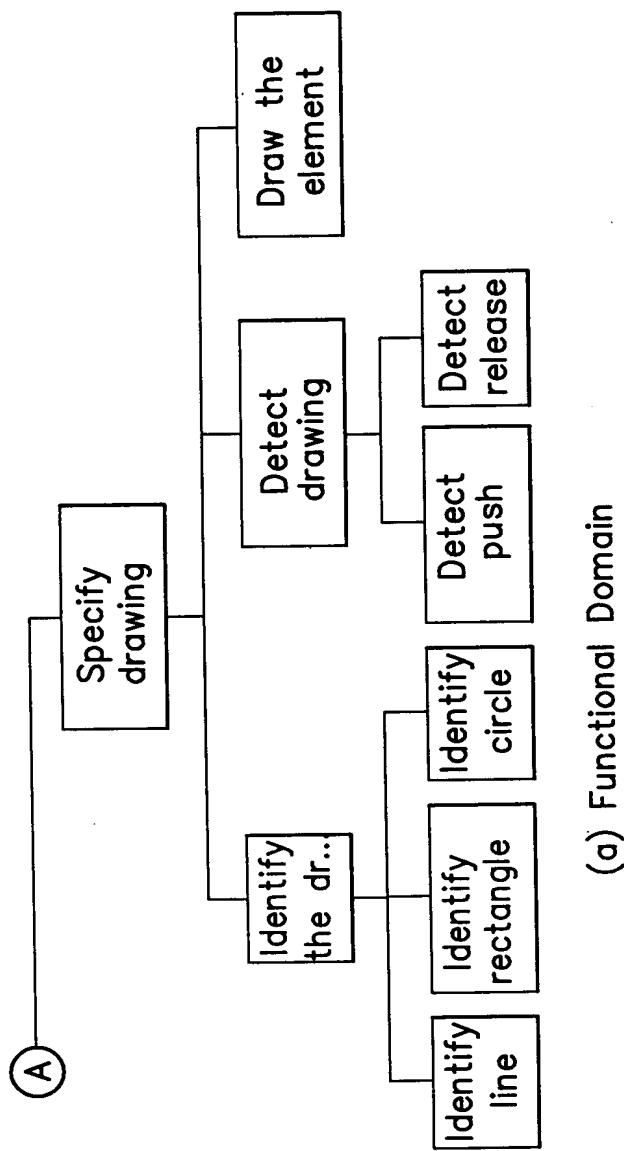


FIG. 28A(1) FIG. 28A(2)

FIG. 28A(1)



(a) Functional Domain

FIG. 28A(2)

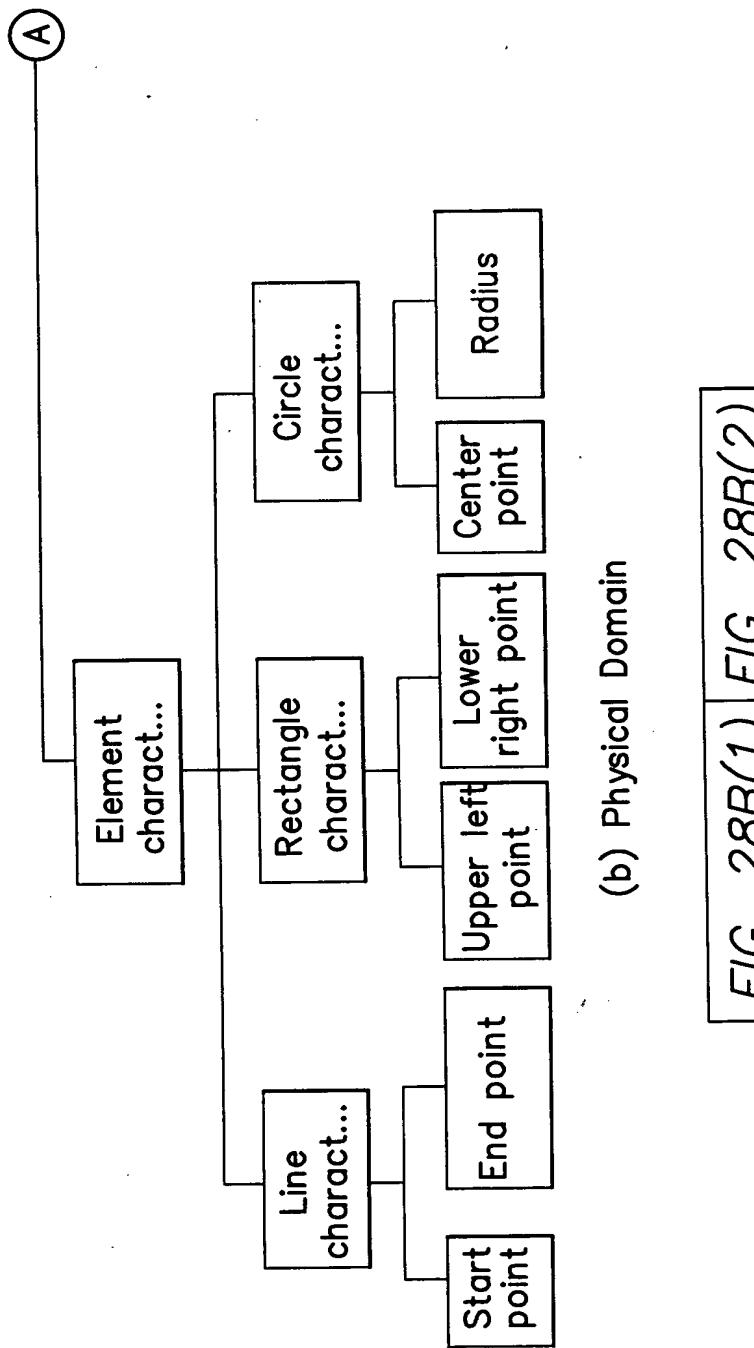
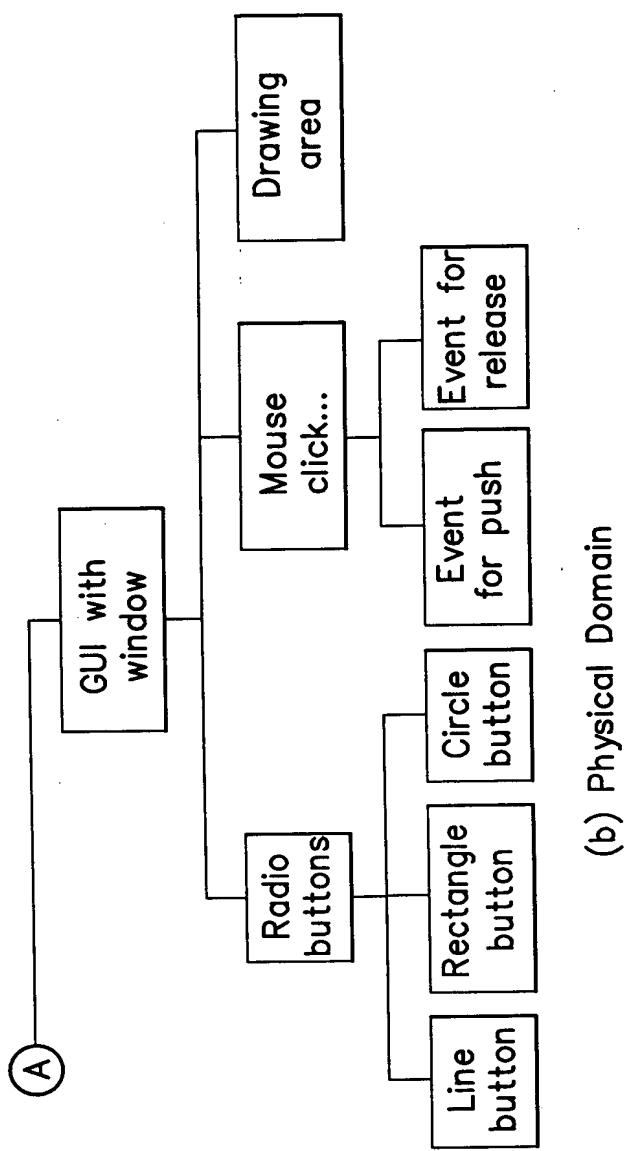


FIG. 28B(1)



(b) Physical Domain

FIG. 28B(2)

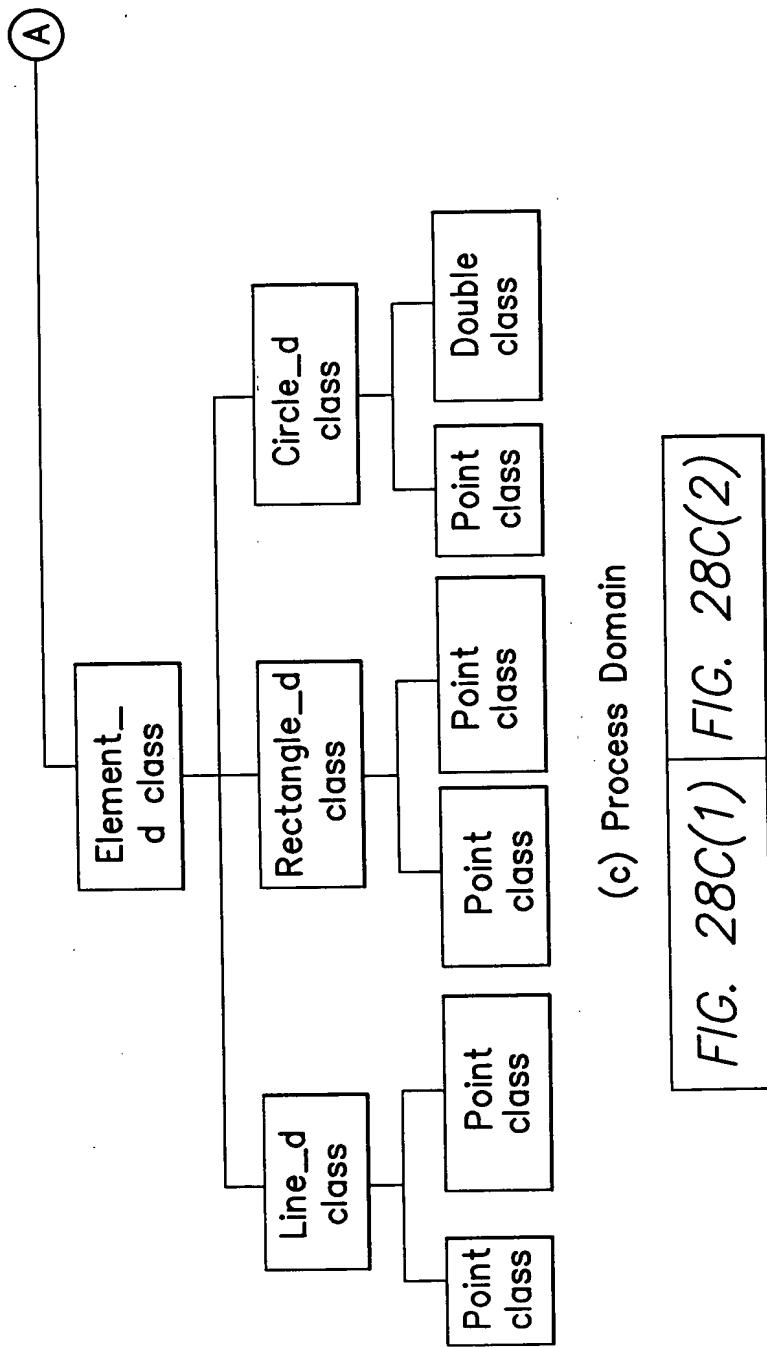


FIG. 28C(1) FIG. 28C(2)

FIG. 28C(1)

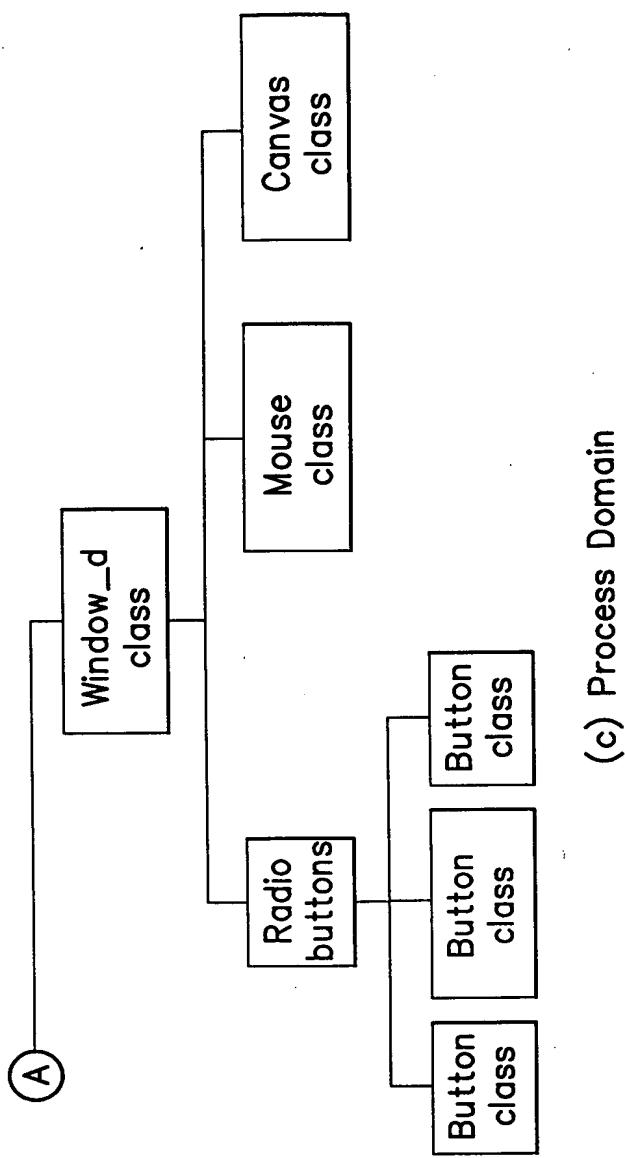


FIG. 28C(2)

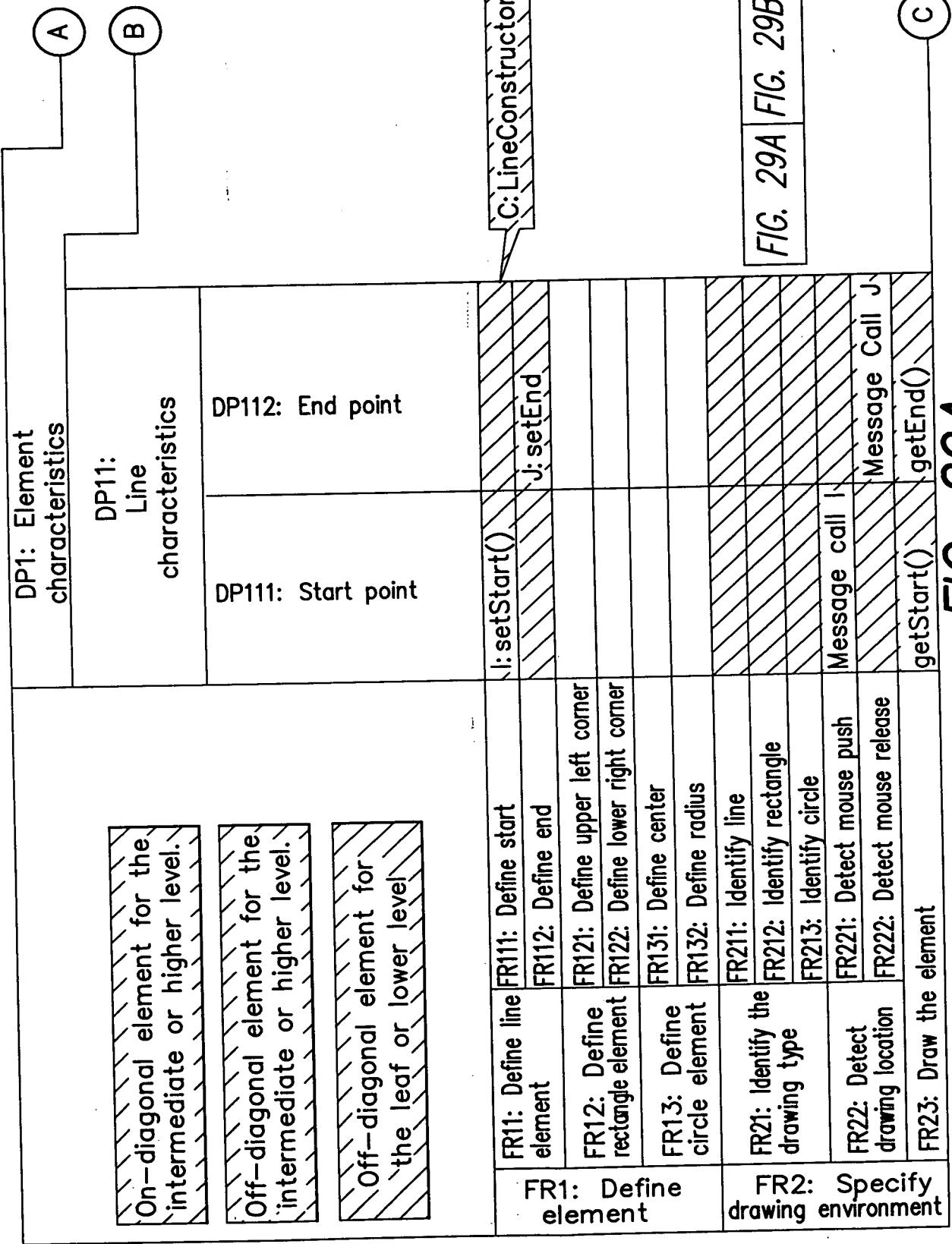


FIG. 29A

C

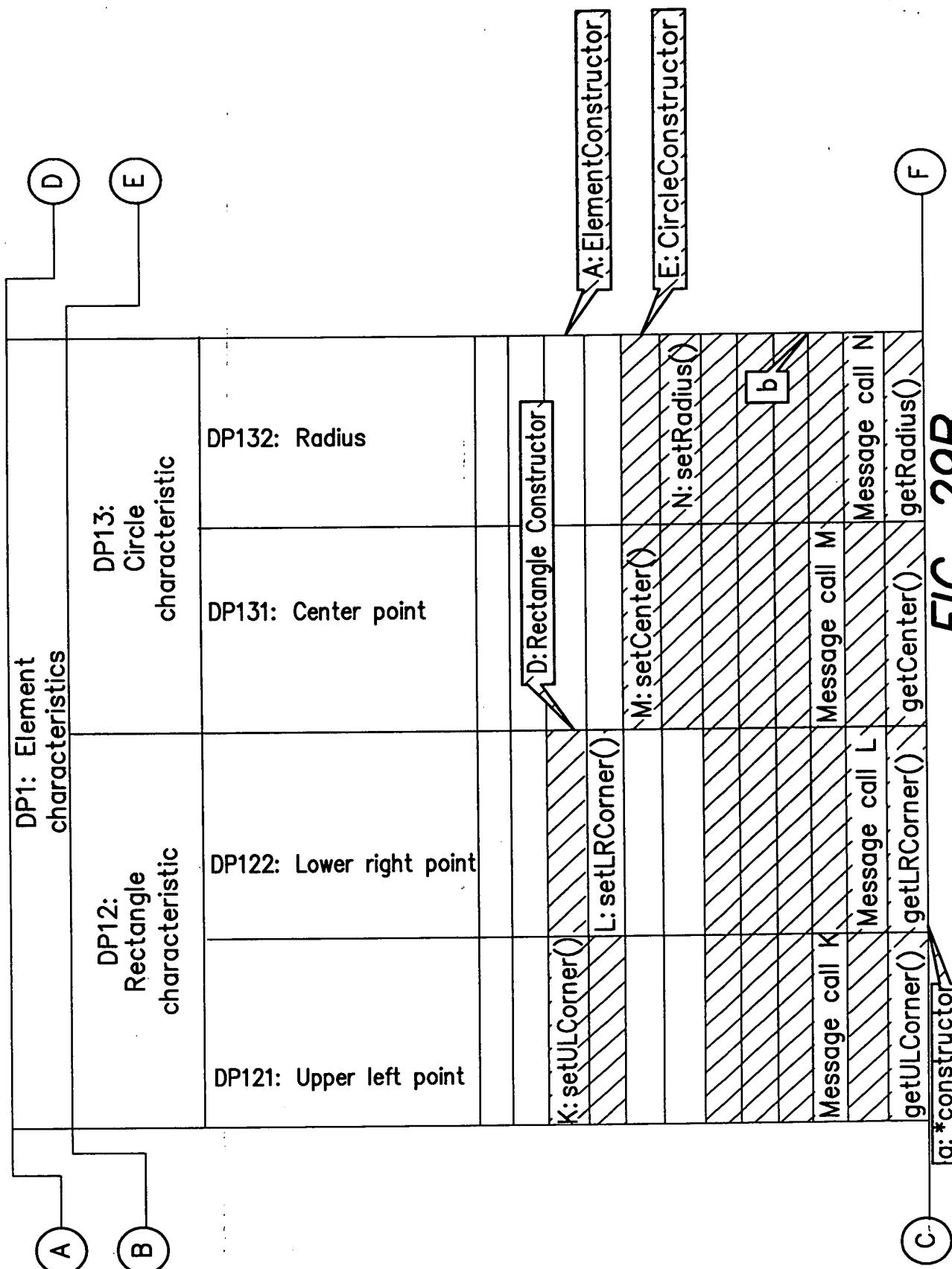


FIG. 29B

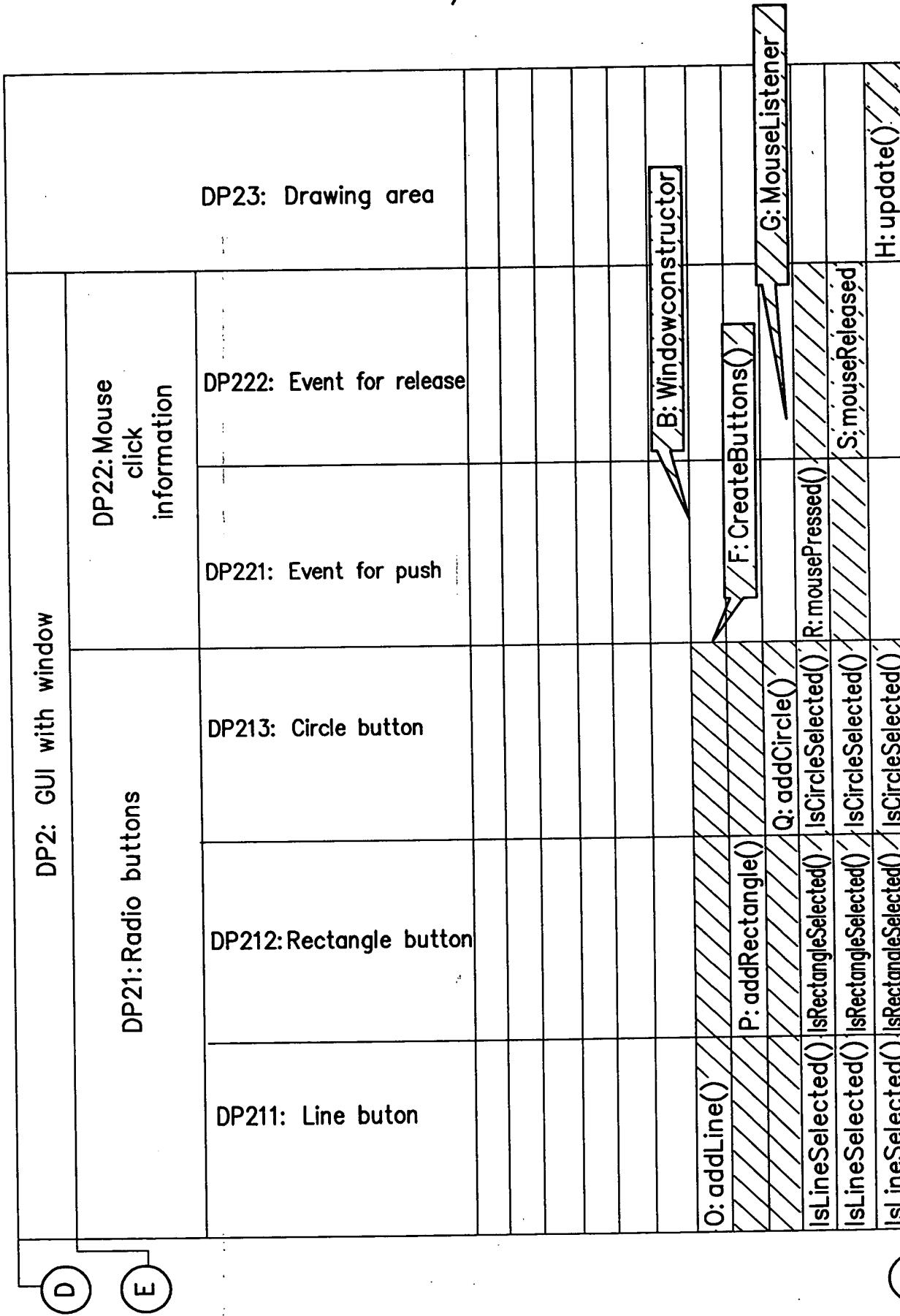


FIG. 29C

A

Object	Object 111/112/121/122/131	Object 132	Object 11	Object 12	Object 13			
Name	Point	Double	Line_d	Rectangle_d	Circle_d			
Attribute			DP111 Point start DP112 Point end	DP121 Point upper_left DP122 Point lower_right	DP131 Point center DP132 Double radius			
Method			C I J	Line() setStart() setEnd()	D K L	Rectangle() setULCorner() setLRCorner()	E M N	Center() setCenter() setRadius()

FIG. 30A FIG. 30B

FIG. 30A

FIG. 30B

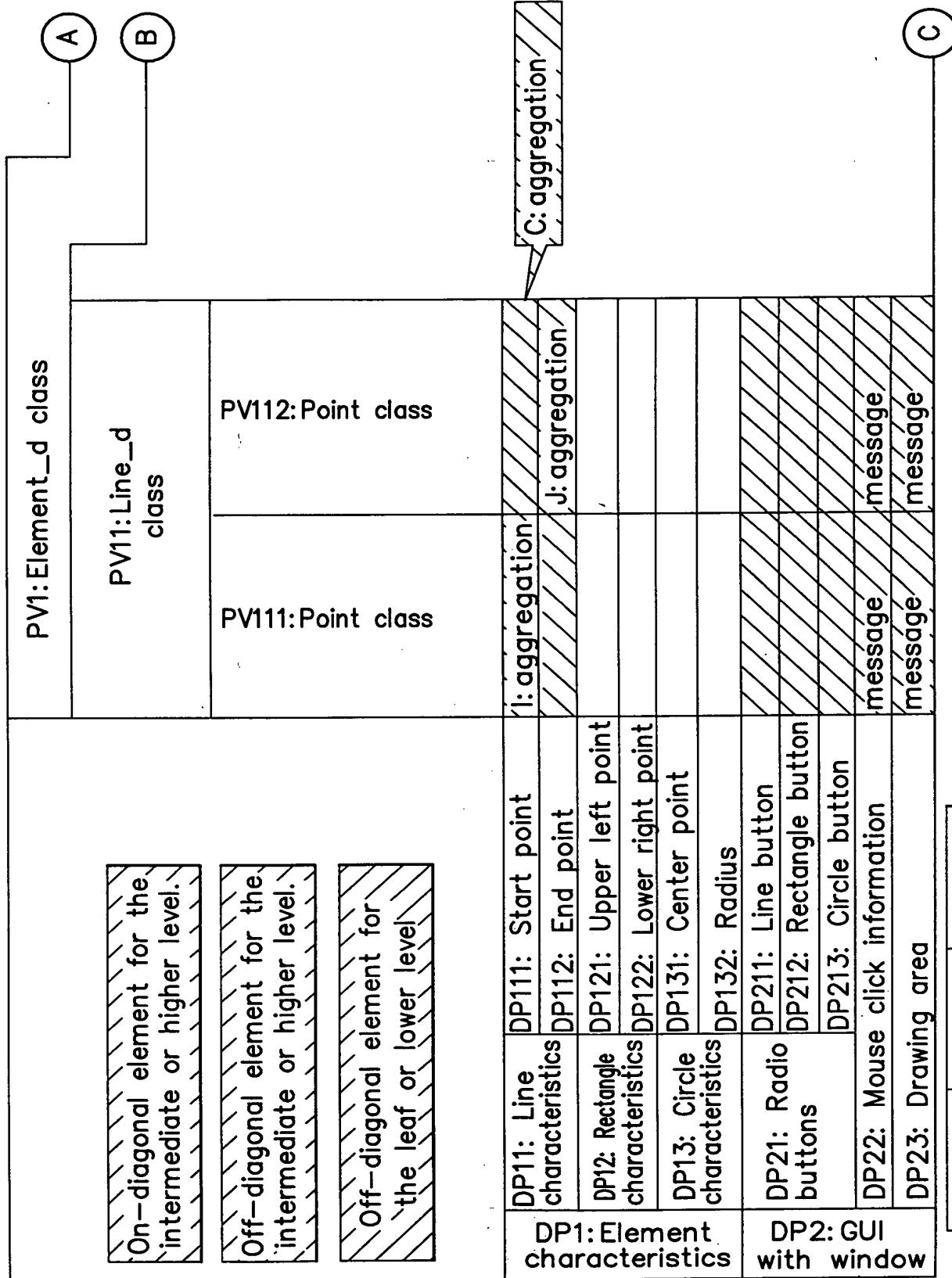


FIG. 31A | FIG. 31B | FIG. 31C

FIG. 31A

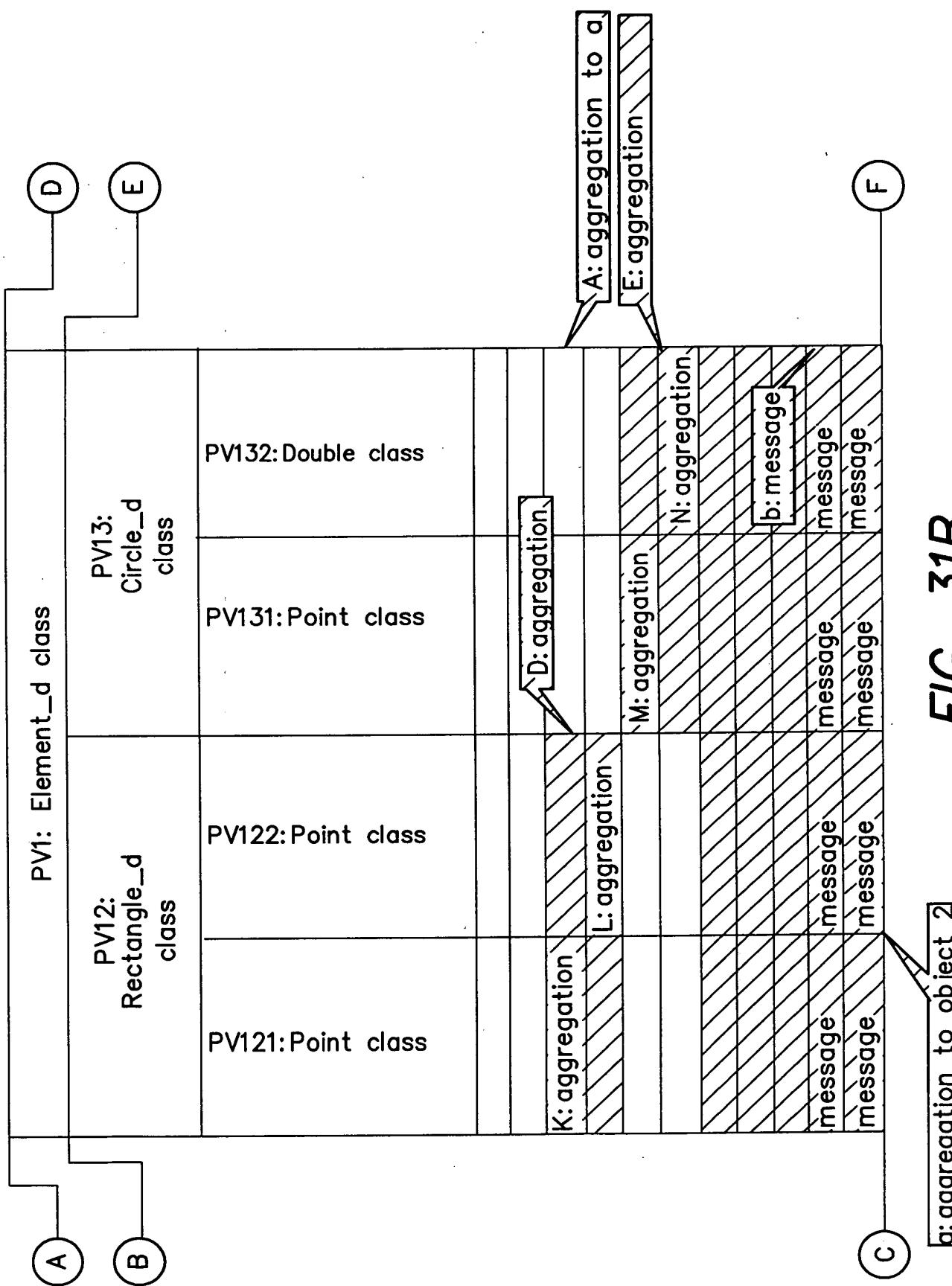


FIG. 31B

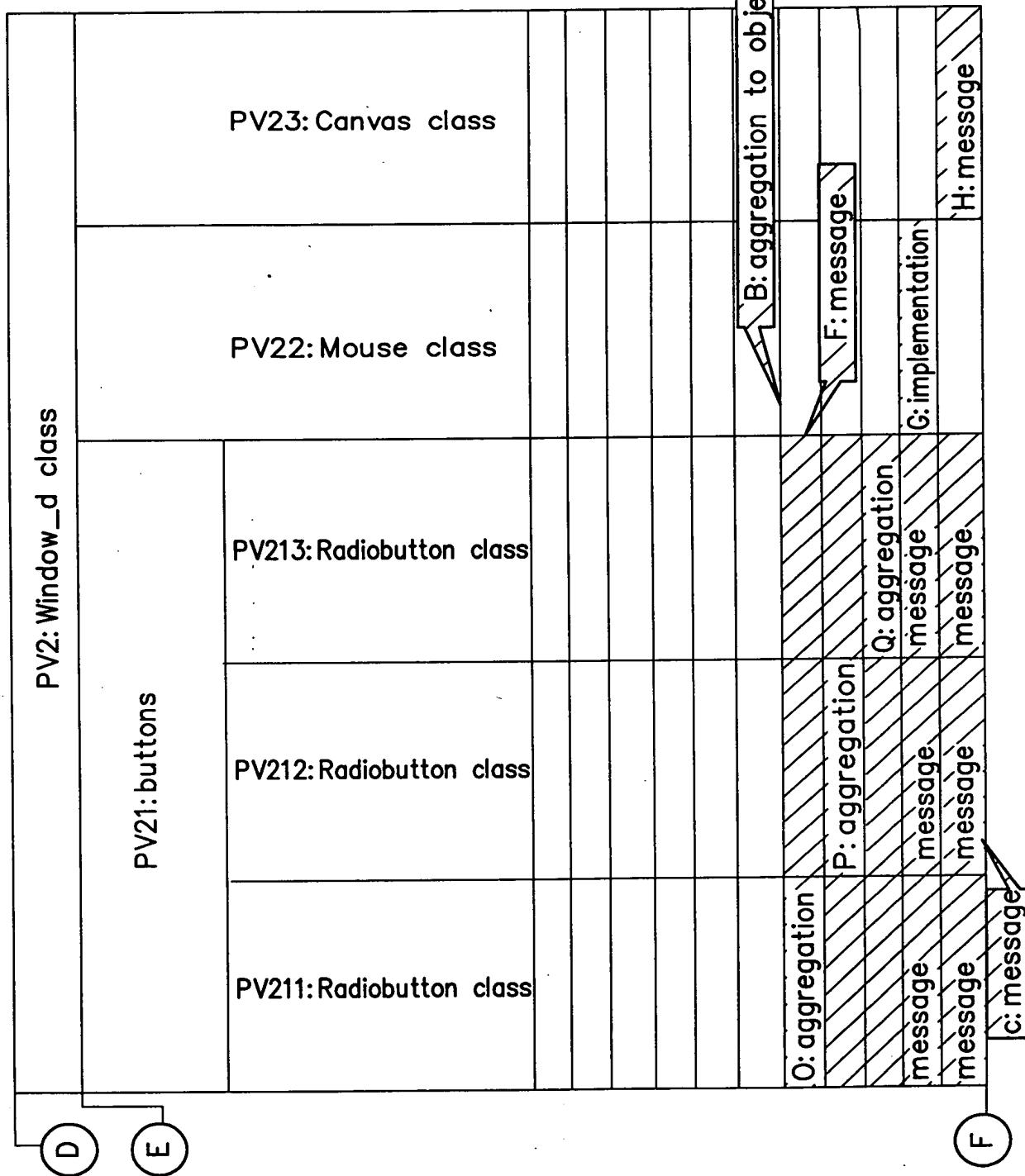
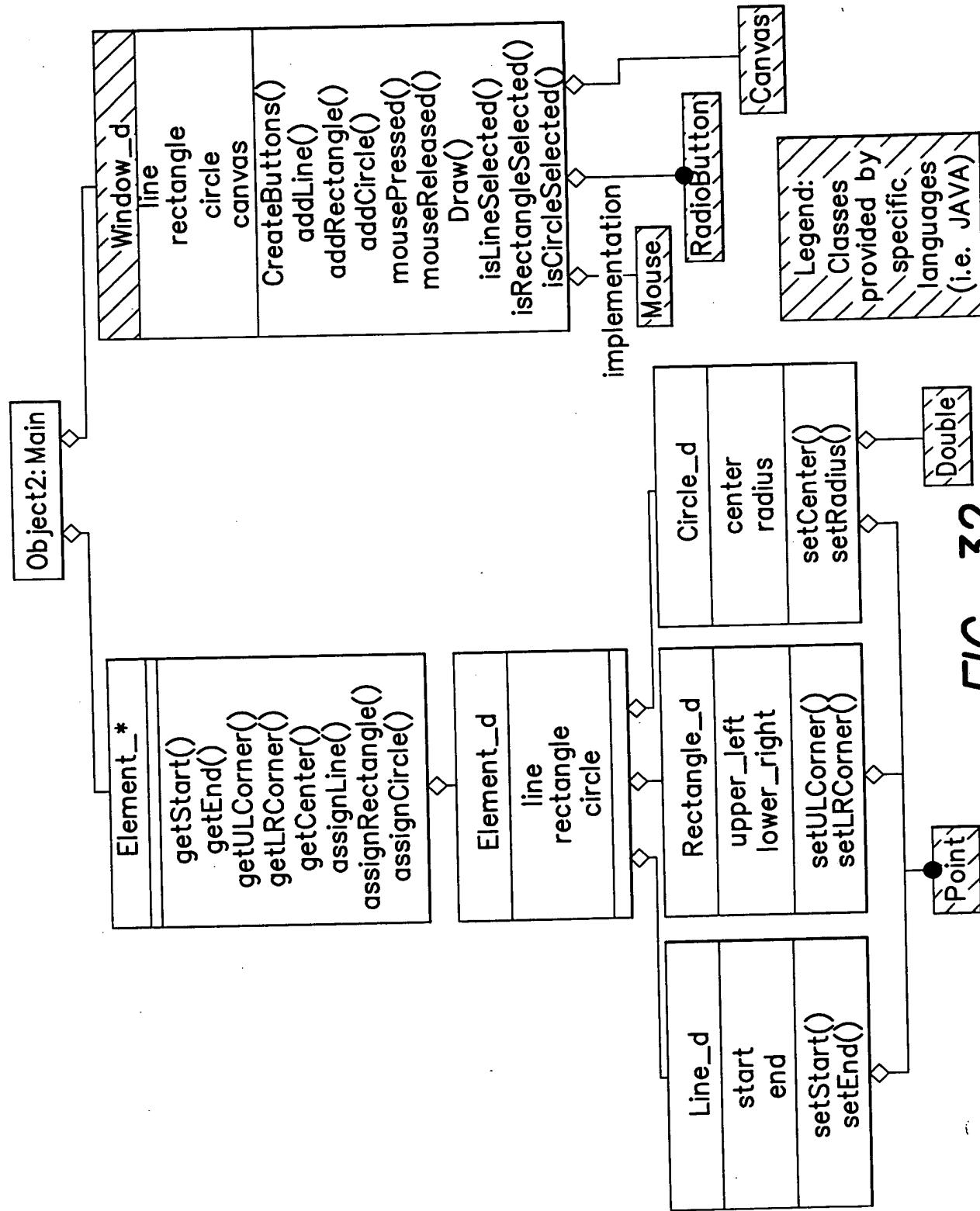


FIG. 31C



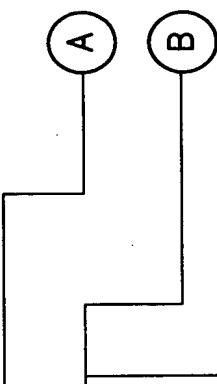
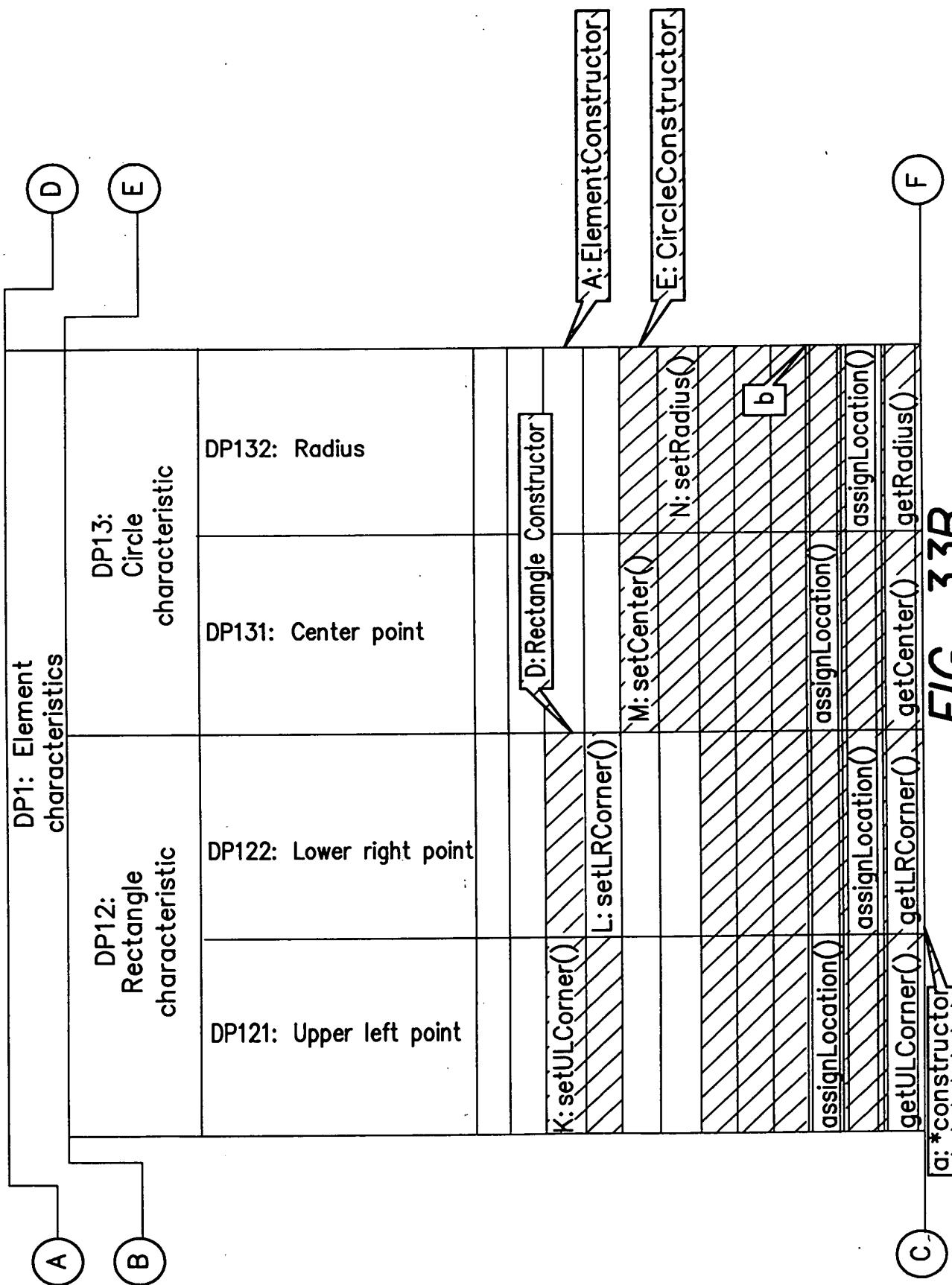
 <p>On-diagonal element for the intermediate or higher level.</p> <p>Off-diagonal element for the intermediate or higher level.</p> <p>Off-diagonal element for the leaf or lower level.</p>	DP1: Element characteristics	DP11: Line characteristics	 <p>DP112: End point</p> <p>DP111: Start point</p>	 <p>J: setStart()</p> <p>J: setEnd()</p>	 <p>C: LineConstructor</p>
	FR11: Define line element	FR111: Define start			
	FR112: Define rectangle element	FR112: Define end			
FR1: Define element	FR121: Define upper left corner	FR122: Define lower right corner			
	FR131: Define center	FR132: Define radius			
	FR211: Identify line	FR212: Identify rectangle			
	FR213: Identify circle	FR221: Detect mouse push	assignLocation()	assignLocation()	
	FR222: Detect mouse release	FR23: Draw the element	getStart()	getEnd()	
	FR2: Specify drawing environment				

FIG. 33A

C



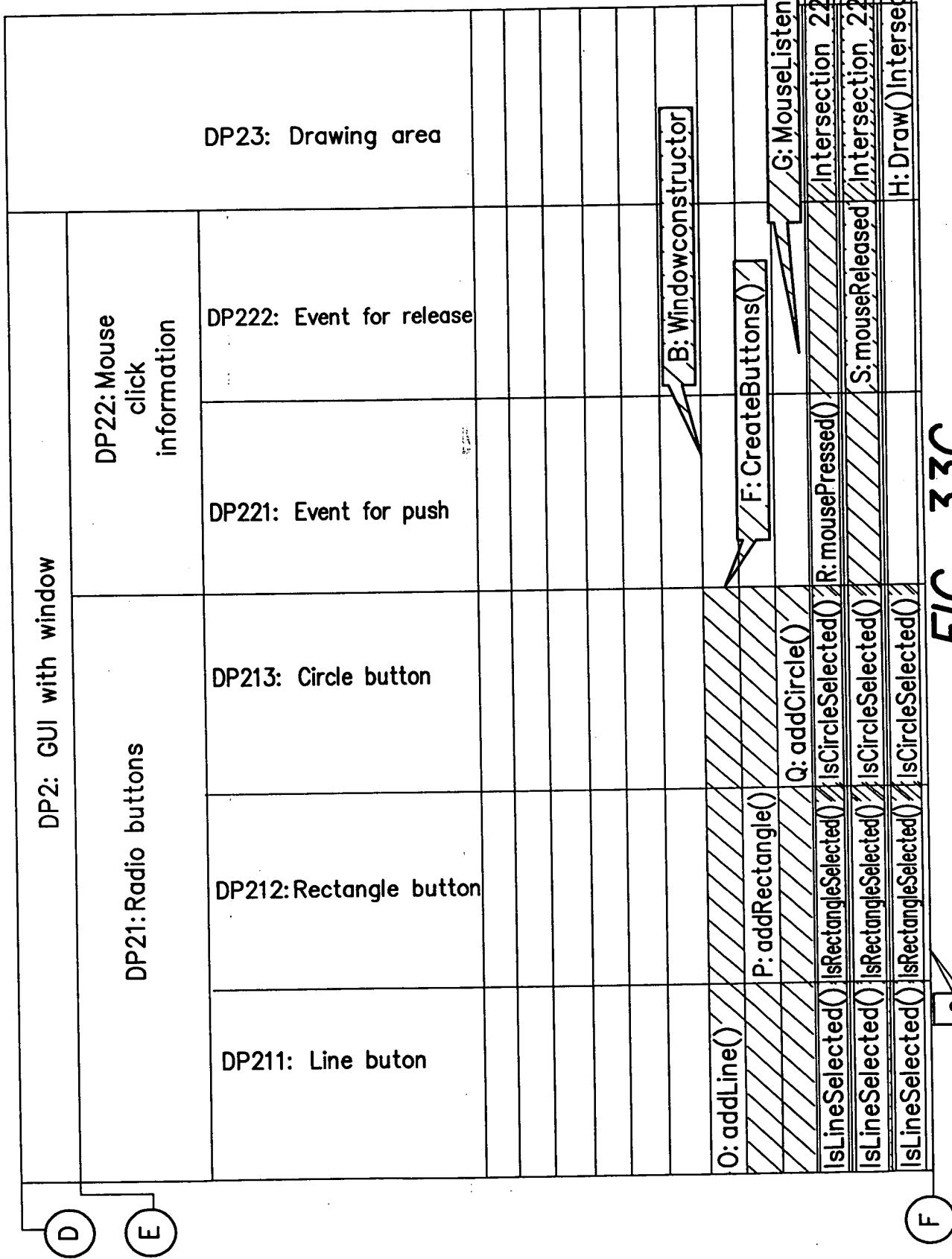


FIG. 33C

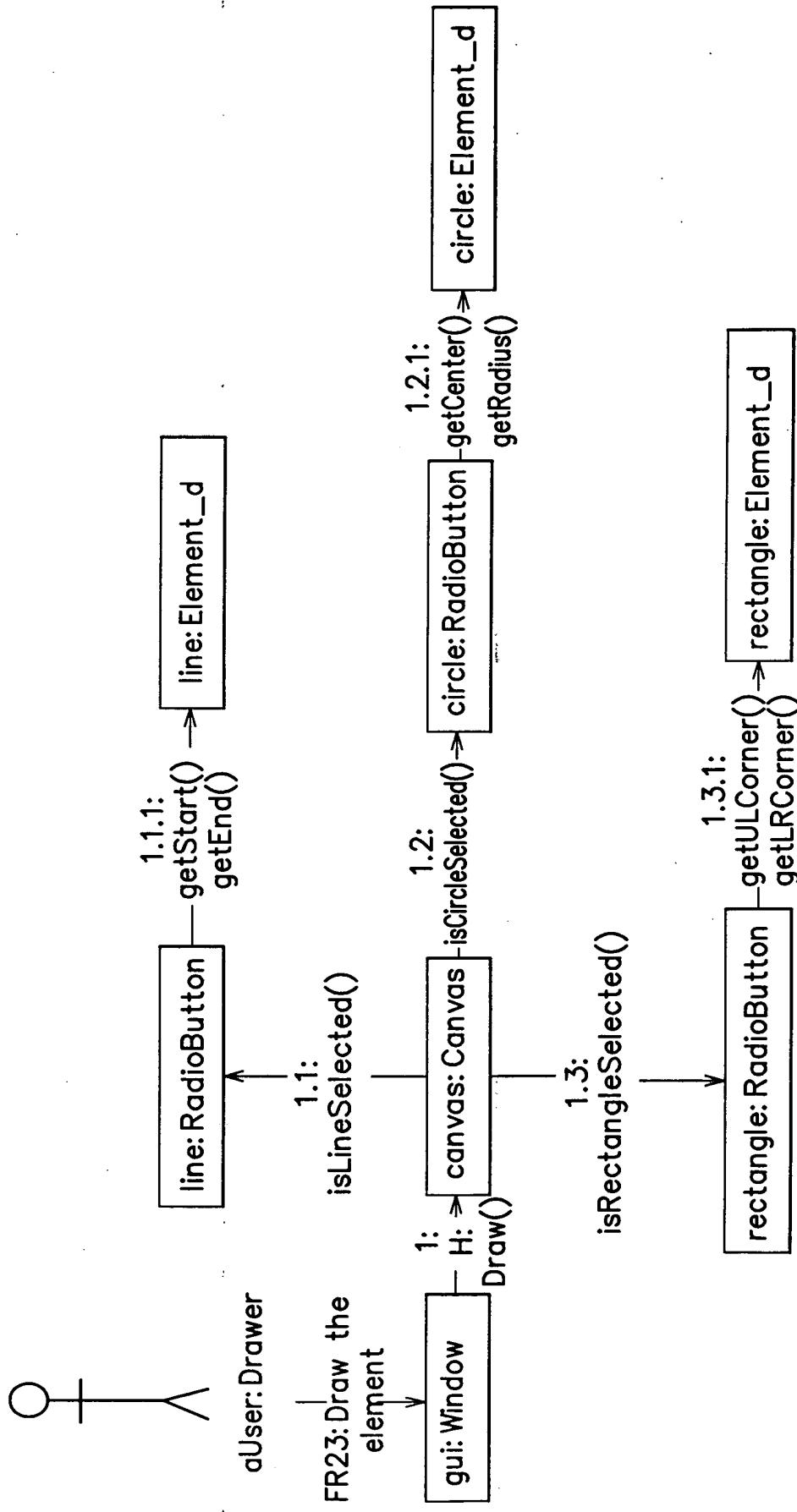


FIG. 34

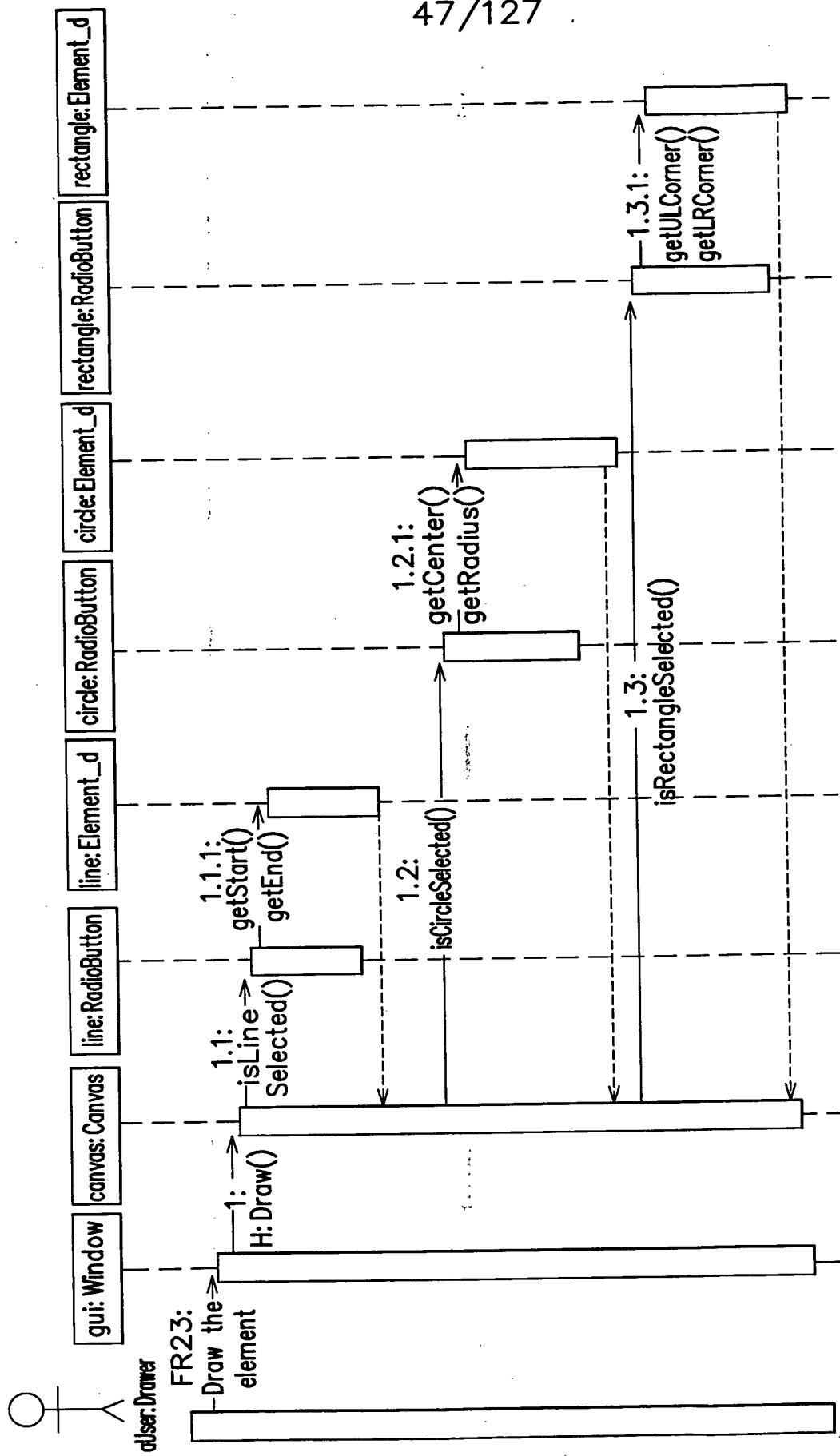


FIG. 35

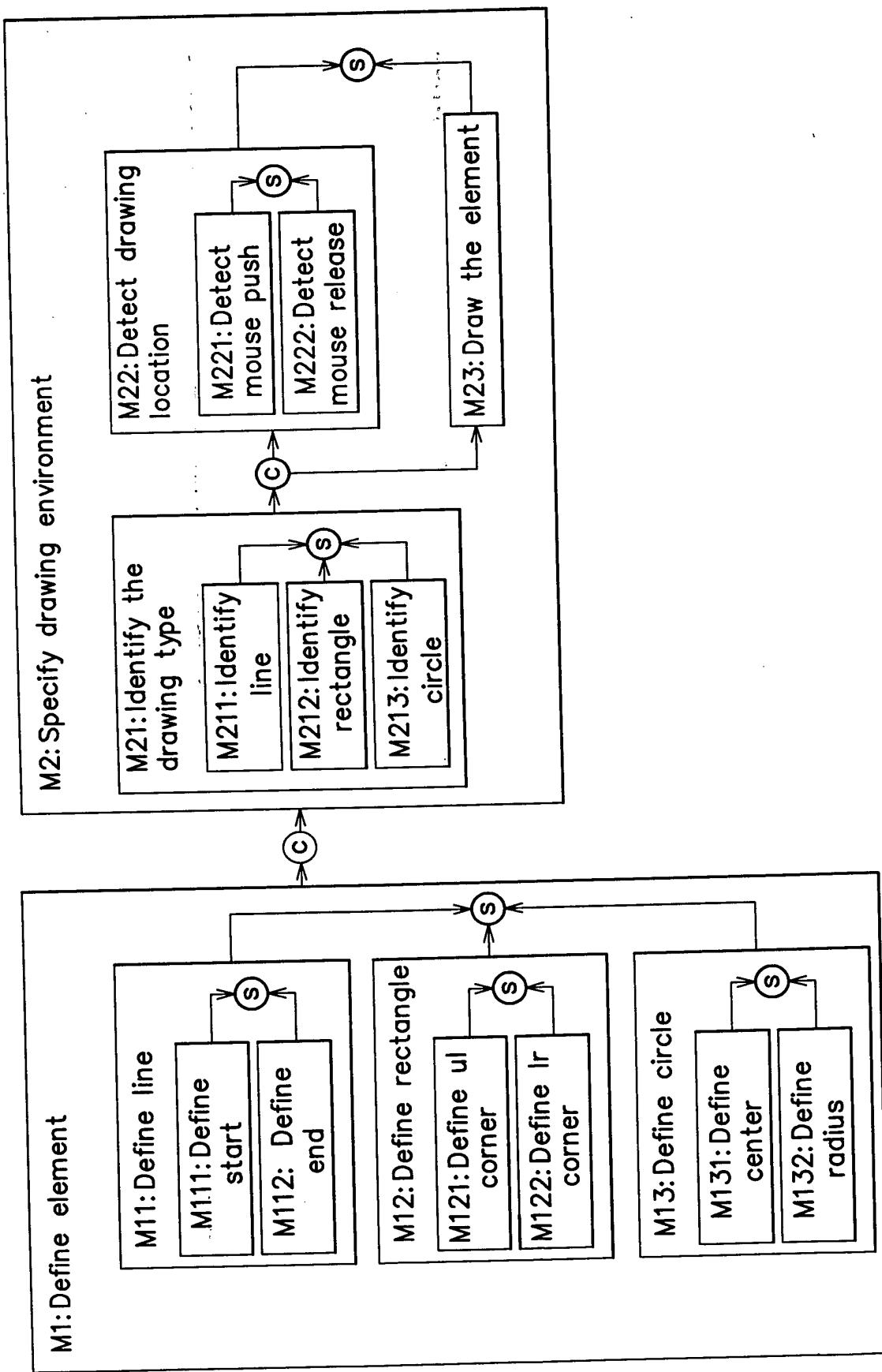


FIG. 36

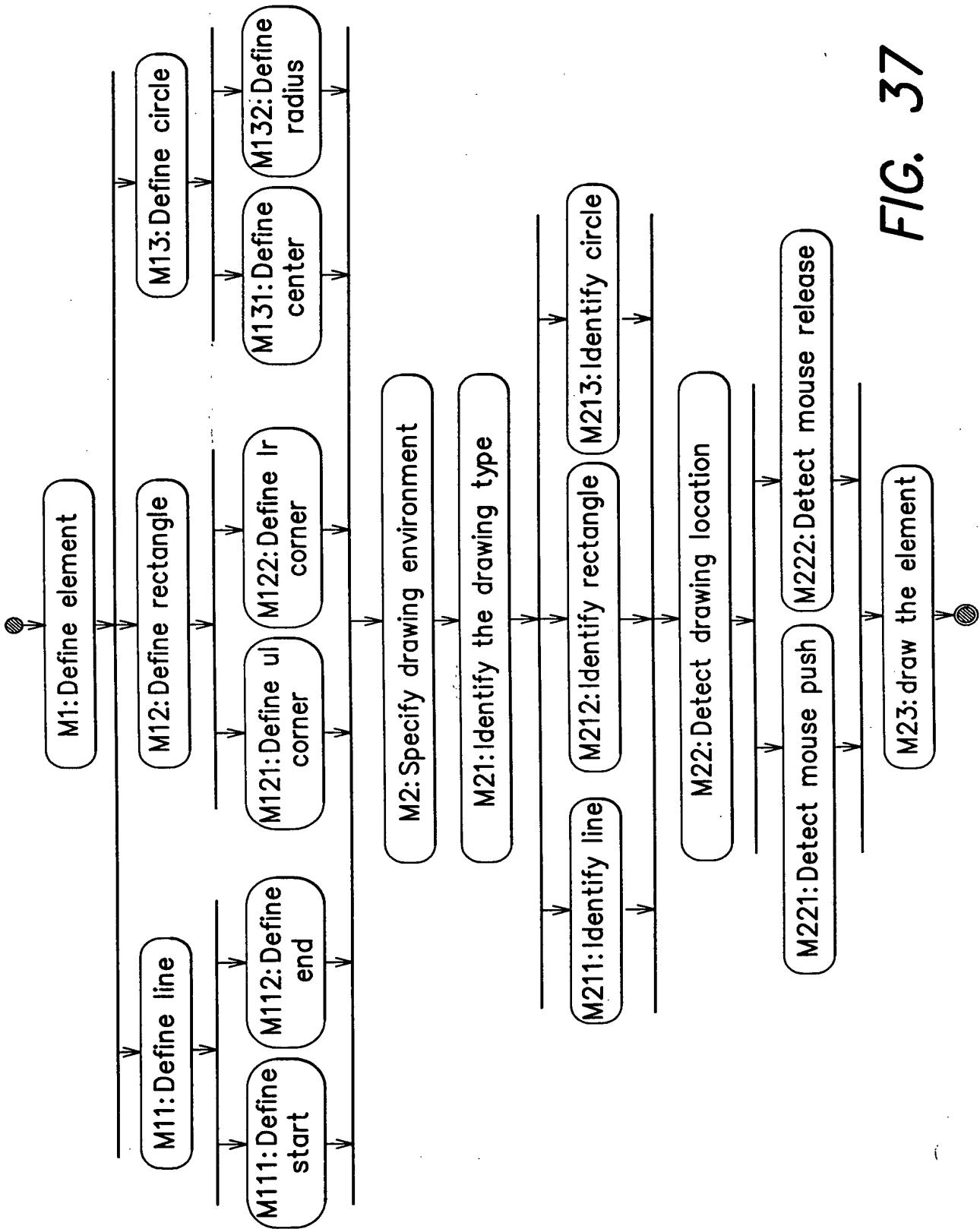


FIG. 37

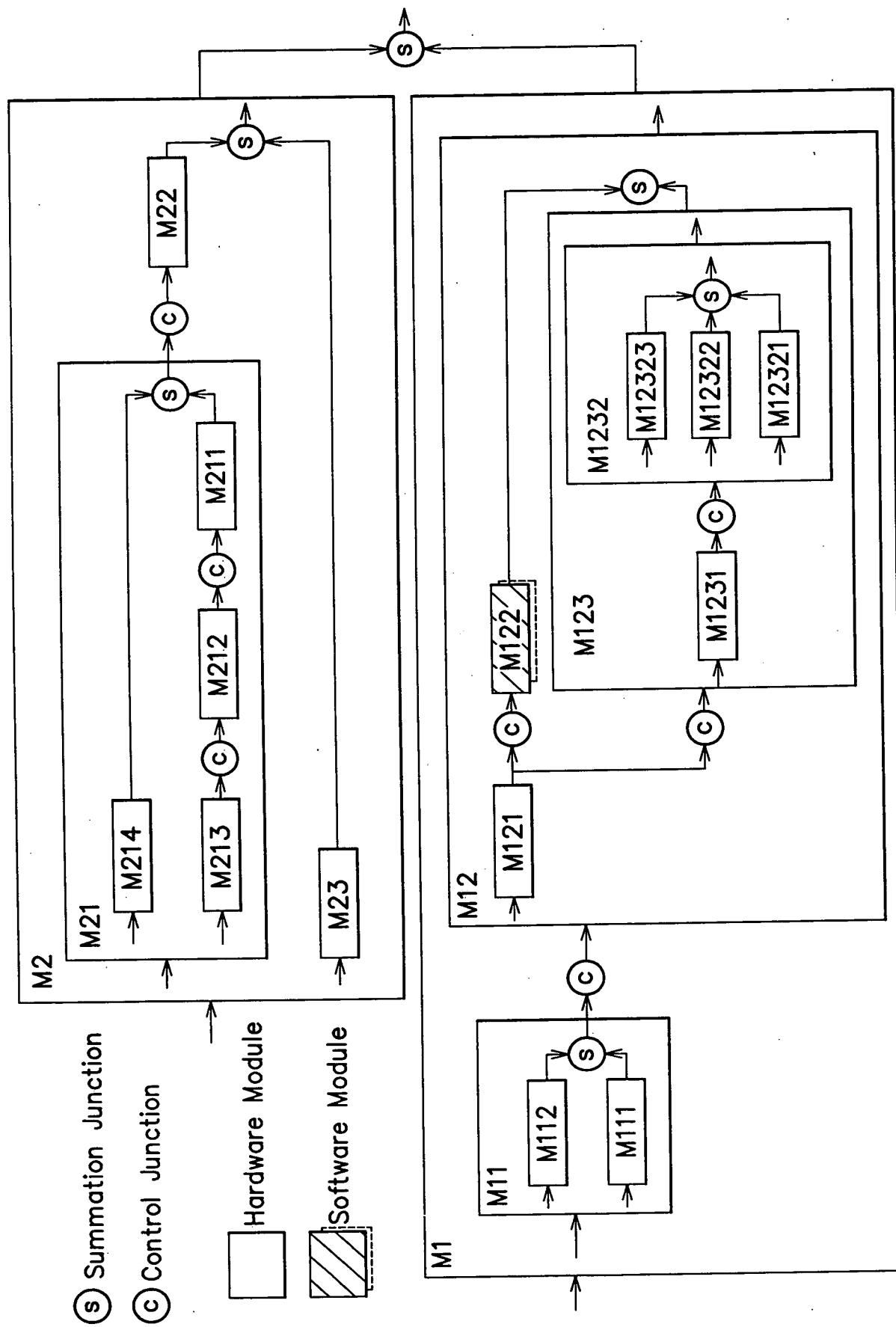


FIG. 38

```

(object Petal
  version 40)
  (object Design "Logical View"
    TRUE
    TRUE
    "SDATA\\demo1.mdl"
    "3353F13A0384"
    quid
    defaults
      (object defaults
        rightMargin 0.250000
        leftMargin 0.250000
        topMargin 0.250000
        bottomMargin 0.500000
        pageOverlap 0.250000
        clipIconLabels TRUE
        autoResize TRUE
        snapToGrid TRUE
        gridX 16
        gridY 16
        defaultFont
          (object Font
            9
            "helvetica"
            FALSE
            FALSE
            FALSE
            FALSE
            FALSE
            0
            default_color TRUE)
      )
  )

```

FIG. 39A
FIG. 39B

FIG. 39A

B

A

```

showMessageNum 1 TRUE
showClassOfObject "Unified"
notation
root_usecase_package
quid
exportControl
global
logical_models (list unit_reference_list
(objectClass"Student"
"3353F13A0386"
"Public"
TRUE
quid
documentation
stereotype
"3353F162000A"
"Someone who is registered to take classes at the University"
"Actor")

```

FIG. 39B

Code	Parent Number	Description	Keyword	Comment	Category	Verification	Leaf
EX-a	0	1 Define element	—	—	—	—	FALSE
EX-a	0	2 Specify drawing environment	—	—	—	—	FALSE
EX-a	1	1 Define line element	—	—	—	—	FALSE
EX-a	1	2 Define rectangle element	—	—	—	—	FALSE
EX-a	1	3 Define circle element	—	—	—	—	FALSE
EX-a	1.1	1 Define start	—	—	—	—	TRUE
EX-a	1.1	2 Define end	—	—	—	—	TRUE
EX-a	1.2	1 Define upper left corner	—	—	—	—	TRUE
EX-a	1.2	2 Define lower right corner	—	—	—	—	TRUE
EX-a	1.3	1 Define center	—	—	—	—	TRUE
EX-a	1.3	2 Define radius	—	—	—	—	TRUE
EX-a	2	1 Identify the drawing type	—	—	—	—	FALSE
EX-a	2	2 Detect drawing location	—	—	—	—	FALSE
EX-a	2	3 Draw the element	—	—	—	—	TRUE
EX-a	2.1	1 Identify line	—	—	—	—	TRUE
EX-a	2.1	2 Identify rectangle	—	—	—	—	TRUE
EX-a	2.1	3 Identify circle	—	—	—	—	TRUE
EX-a	2.2	1 Detect mouse push	—	—	—	—	TRUE
EX-a	2.2	2 Detect mouse release	—	—	—	—	TRUE

FIG. 40

Code	Parent	Number	Alternative	Description	Keyword	Comment	Category	Verification	Leaf
EX-a	0	1	0	Element characteristics	-	-	-	-	FALSE
EX-a	0	2	0	GUI with window	-	-	-	-	FALSE
EX-a	1	1	0	Line characteristics	-	-	-	-	FALSE
EX-a	1	2	0	Rectangle characteristics	-	-	-	-	FALSE
EX-a	1	3	0	Circle characteristics	-	-	-	-	FALSE
EX-a	1.1	1	0	Start point	-	-	-	-	TRUE
EX-a	1.1	2	0	End point	-	-	-	-	TRUE
EX-a	1.2	1	0	Upper left point	-	-	-	-	TRUE
EX-a	1.2	2	0	Lower right point	-	-	-	-	TRUE
EX-a	1.3	1	0	Center point	-	-	-	-	TRUE
EX-a	1.3	2	0	Radius	-	-	-	-	TRUE
EX-a	2	1	0	Radio buttons	-	-	-	-	FALSE
EX-a	2	2	0	Mouse click information	-	-	-	-	FALSE
EX-a	2	3	0	Drawing area	-	-	-	-	TRUE
EX-a	2.1	1	0	Line button	-	-	-	-	TRUE
EX-a	2.1	2	0	Rectangle button	-	-	-	-	TRUE
EX-a	2.1	3	0	Circle button	-	-	-	-	TRUE
EX-a	2.2	1	0	Event for push	-	-	-	-	TRUE
EX-a	2.2	2	0	Event for release	-	-	-	-	TRUE

FIG. 41A FIG. 41B

FIG. 41A

FIG. 41B

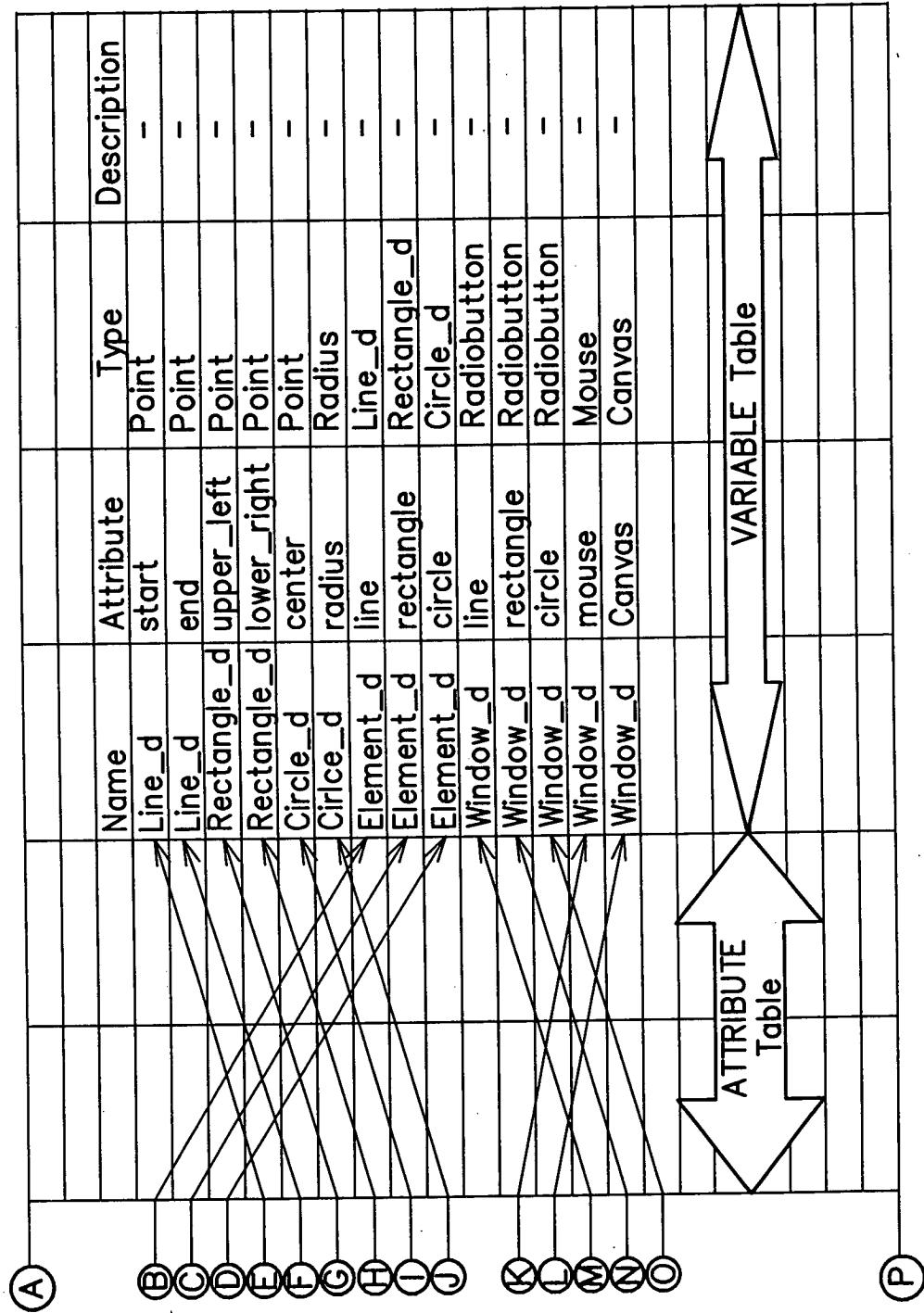


FIG. 41B

Code1	Code2	Value	Comment	Name	Method	Type	Description
Ex-a.0.1	Ex-a.0.1.0	A	-	Line_d	Line_d()	Line_d	-
Ex-a.0.2	Ex-a.0.1.0	a	-	Line_d	setStart()	void	-
Ex-a.0.2	Ex-a.0.2.0	B	-	Line_d	setEnd()	void	-
Ex-a.1.1	Ex-a.1.1.0	C	-	Rectangle_d	Rectangle_d()	Rectangle_d	-
Ex-a.1.2	Ex-a.1.2.0	D	-	Rectangle_d	setULCorner()	void	-
Ex-a.1.3	Ex-a.1.3.0	E	-	Rectangle_d	setLRCorner()	void	-
Ex-a.2.1	Ex-a.2.1.0	F	-	Circle_d	Circle_d()	Circle_d	-
Ex-a.2.2	Ex-a.2.1.0	b	-	Circle_d	setCenter()	void	-
Ex-a.2.2	Ex-a.2.2.0	G	-	Circle_d	setRadius()	void	-
Ex-a.2.3	Ex-a.2.1.0	c	-	Element_d	Element_d()	Element_d	-
Ex-a.2.3	Ex-a.2.3.0	H	-	Window_d	Window_d()	Window_d	-
Ex-a.1.1.1	Ex-a.1.1.1.0	I	-	Window_d	CreateButtons()	void	-
Ex-a.1.1.2	Ex-a.1.1.2.0	J	-	Window_d	addLine()	void	-
Ex-a.1.2.1	Ex-a.1.2.1.0	K	-	Window_d	addRectangle()	void	-
Ex-a.1.2.2	Ex-a.1.2.2.0	L	-	Window_d	addCircle()	void	-
Ex-a.1.3.1	Ex-a.1.3.1.0	M	-	Window_d	MouseListener()	void	-
Ex-a.1.3.2	Ex-a.1.3.2.0	N	-	Window_d	mousePressed()	Point	-
Ex-a.2.1.1	Ex-a.2.1.1.0	O	-	Window_d	mouseReleased()	Point	-
Ex-a.2.1.2	Ex-a.2.1.2.0	P	-	Window_d	draw()	void	-
Ex-a.2.1.3	Ex-a.2.1.3.0	Q	-	Window_d	isLineSelected()	boolean	-
Ex-a.2.2.1	Ex-a.2.2.1.0	R	-	Window_d	isRectangleSelected()	boolean	-
Ex-a.2.2.2	Ex-a.2.2.2.0	S	-	Window_d	isCircleSelected()	boolean	-

FIG. 42A
FIG. 42B

(A)

FIG. 42A

(B)

(C)

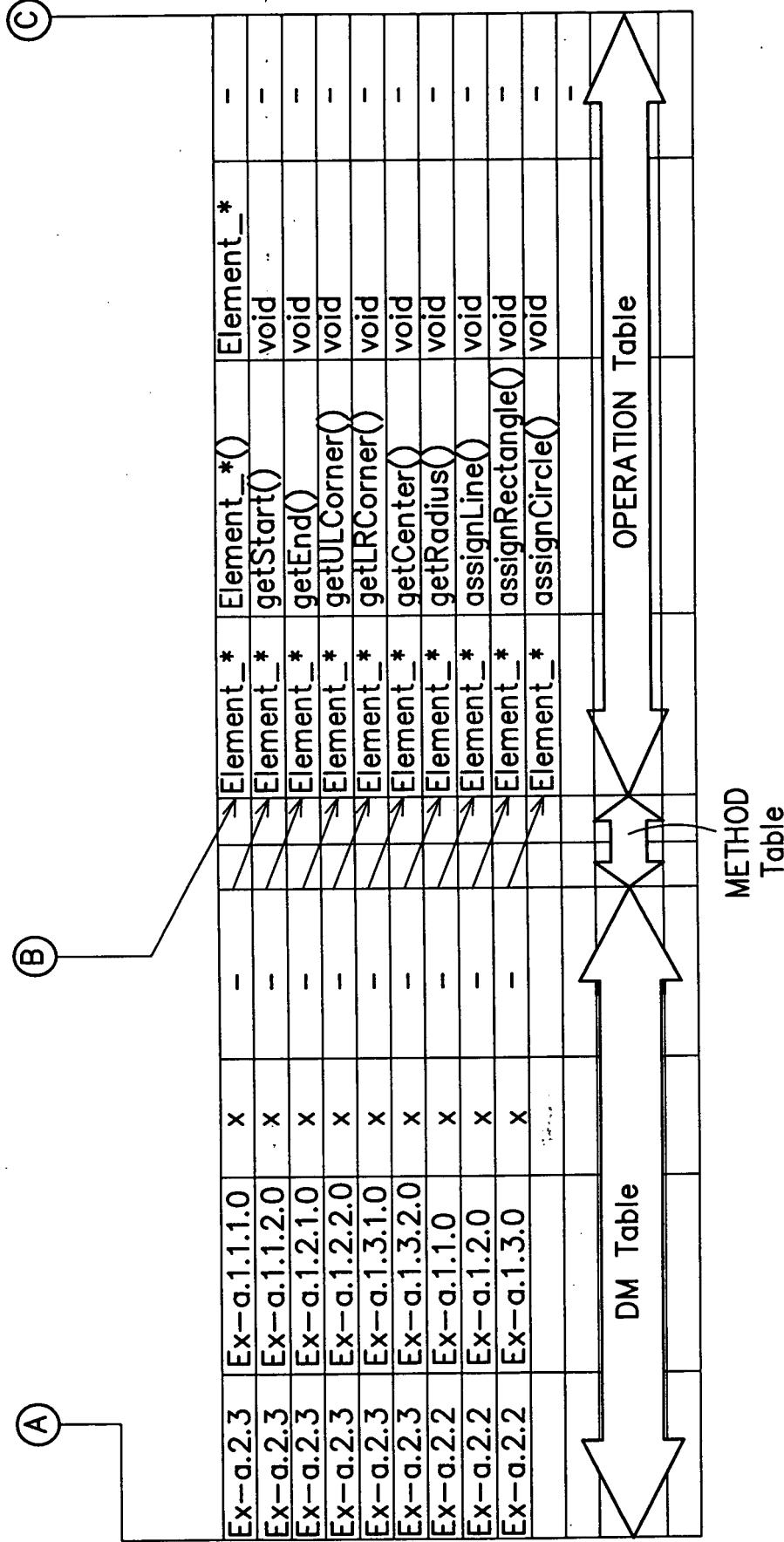


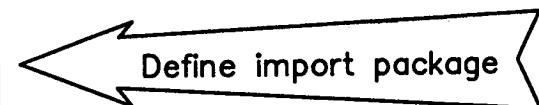
FIG. 42B

```
/*
Comments for class:
File Name
FR description
DP description
...
*/

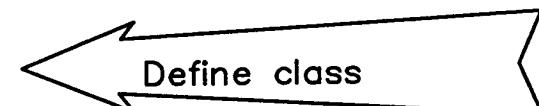
```



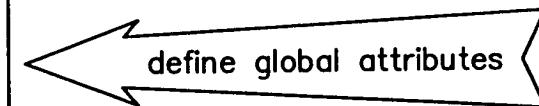
```
Reference for import or include
```



```
Package PackageName
ClassType ClassName {
```



```
/*
Comments for attributes
FR description
DP description
...
*/
AttributeType AttributeName:
AttributeType AttributeName:
AttributeType AttributeName:
```



A

FIG. 43A
FIG. 43B

B

FIG. 43A

A

B

```

/*
Comments for constructor
  FR description
  DP description
  ...
*/
ClassType ConstructorName() {
  /*Comments for
  component
  FR description
  DP description
  ...
*/
  ComponentHandling();
  ComponentHandling();
  ComponentHandling();
}

```

Define constructor

Define component
(e.g. Initialization for
the given attributes)

```

/*
Comments for method
  FR description
  DP description
  ...
*/
MethodType MethodName() {
  /*Comments for
  sequence
  FR description
  DP description
  ...
*/
  RelatedMessageCall();
  RelatedMessageCall();
  RelatedMessageCall();
}

```

Define methods

Define coding sequence
(e.g. Interaction which describes
off-diagonal activities)

```

}
/* source code end*/

```

Define finish

FIG. 43B

/*

Comments for class:

File Name
 FR description
 DP description
 ...

*/

/*

Comments for class:

File Name: Window_d.java

FR2: Specify drawing environment
 DP2: GUI with window
 FR2=a*DP1(Element characteristic)+B*DP2(GUI with window)

*/

Reference for import or include

```
import javax.swing.*;  

import java.awt.*;
```

Package PackageName

ClassType ClassName {

public class window_d { /*DP2*/

/*

Comments for attributes
 FR description
 DP description
 ...

*/

AttributeType AttributeName;
 AttributeType AttributeName;
 AttributeType AttributeName;

/* Comments for attributes:
 FR211: Identify line
 DP211: Line button */
 Radiobutton line; /*DP211*/

/* Comments for attributes:
 FR212: Identify rectangle
 DP212: Rectangle button */
 Radiobutton rectangle; /*DP212*/
 ...

A

FIG. 44A

FIG. 44B

FIG. 44C

B

FIG. 44A

4357416-8297-4620

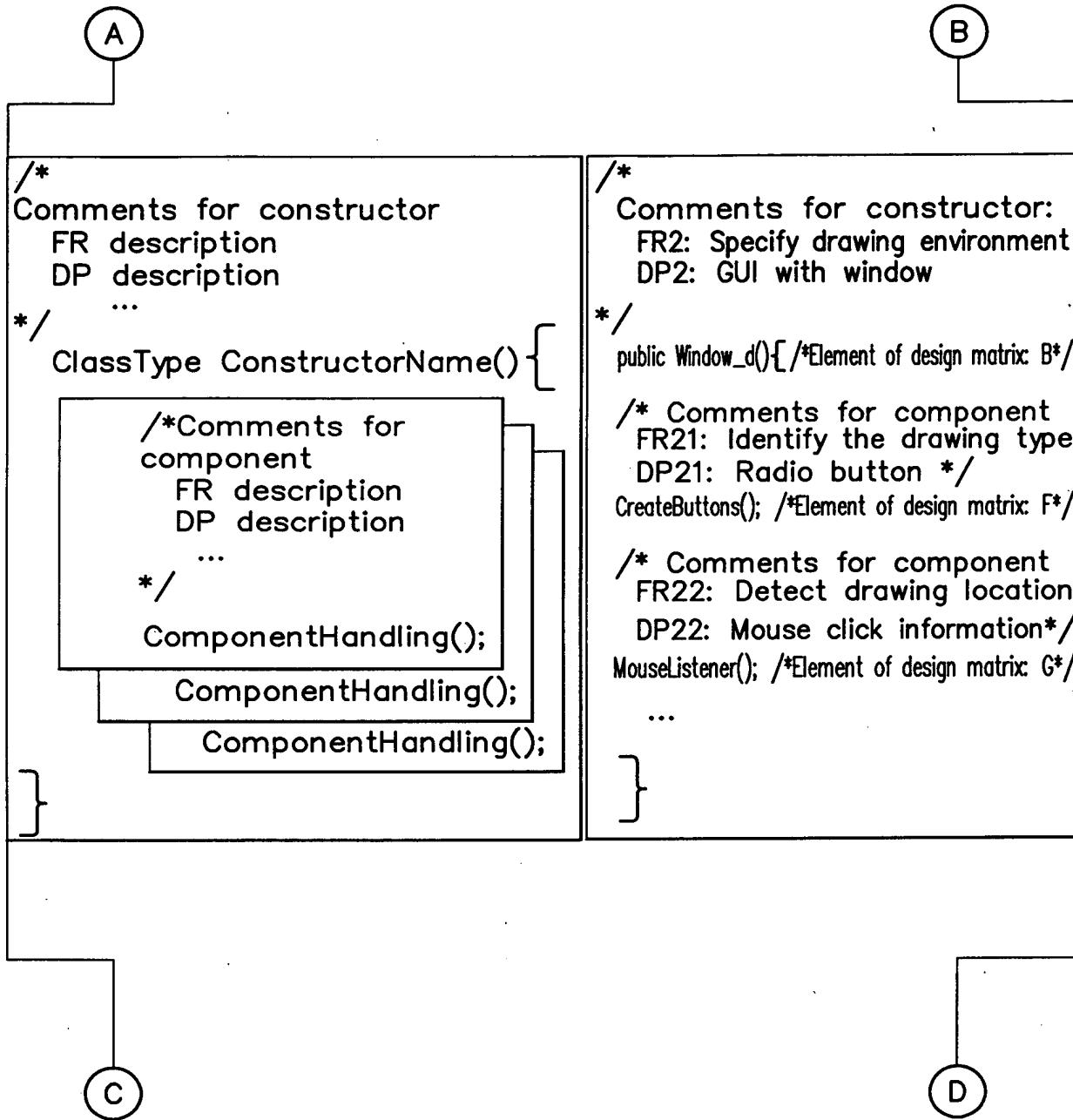


FIG. 44B

F031100-000000000000

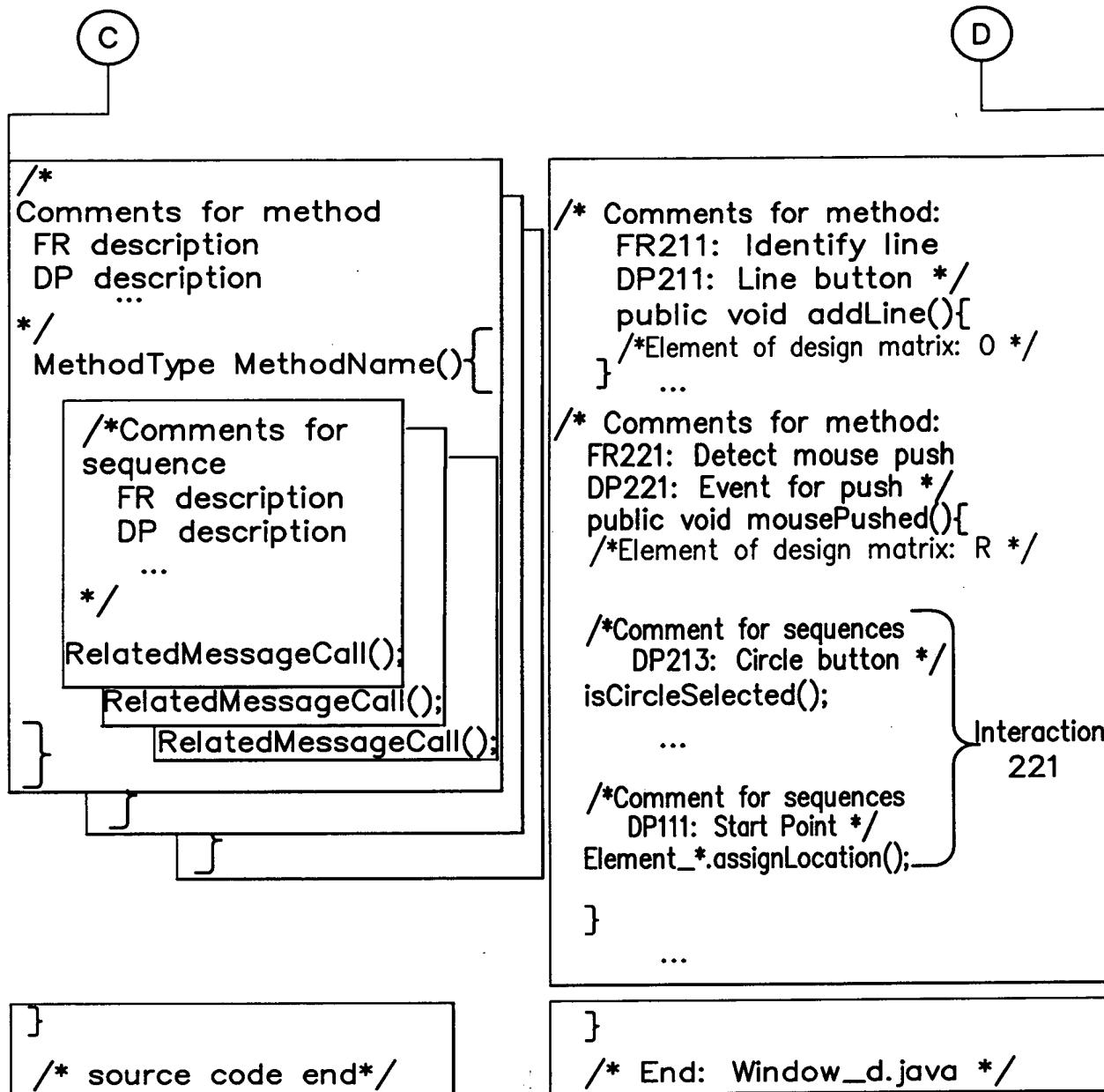


FIG. 44C

FR Information:		DP Information:	
Number	Description	Num...	Description
FR#.1	Provide security	DP#.1	Login privilege
FR#.2	Assign tasks	DP#.2	Resource of desig...
FR#.3	Manage schedule	DP#.3	Schedule—manage...
FR#.4	Construct design h...	DP#.4	Data structure for...
FR#.5	Facilitate changes...	DP#.5	ECO handling tool

FIG. 45A

	FR	DP
1	FR 1 description \leftrightarrow DP 1 description	
2	FR 2 description \leftrightarrow DP 2 description	
3	FR 3 description \leftrightarrow DP 3 description	

FIG. 45B

FR Information:		DP Information:	
Number	Description	Number	Description
FR#.1	Control the water fl...	DP#.1	Angle for flow ra...
FR#.2	Control the temper...	DP#.1(1)	Angle of hot wat...
		DP#.2	Angle for tempe...
		DP#.2(1)	Connecting rod...
		DP#.2(2)	Angle of cold w...

FIG. 46A

TUNING UP FOR 8251P-E-250

	FR	DP
1	FR 1 description	DP 1 description
2	FR 2 description	Alternative DP 2(a)
		Alternative DP 2(b)
		Alternative DP 2(c)
3	FR 3 description	DP 3 description

FIG. 46B

Parent Information:	
Number	Description
FR 1.1	Manage design workflow
DP 1.1	Management roadmap
FR Information:	
Number	Description
FR#.1	Provide security
FR#.2	Assign tasks
FR#.3	Manage schedule
FR#.4	Construct design h...
FR#.5	Facilitate changes...

DP Information:	
Number	Description
DP#.1	Login privilege
DP#.2	Resource of de...
DP#.3	Schedule—mana...
DP#.4	Data structure f...
DP#.5	ECO handling t...

FIG. 47A

F007252-2014-07-20

	FR	DP
Parent	Parent FR description	Parent DP description
1	FR 1 description	DP 1 description
2	FR 2 description	Alternative DP 2(a)
		Alternative DP 2(b)
		Alternative DP 2(c)
3	FR 3 description	DP 3 description

FIG. 47B

Parent Information:	
Number	Description
FR 1.1	Manage design workflow
DP 1.1	Management roadmap
FR Information:	
Number	Description
FR#.1	Provide security
FR#.2	Assign tasks
FR#.3	Manage schedule
FR#.4	Construct design h...
FR#.5	Facilitate changes...

DP Information:	
Number	Description
DP#.1	Login privilege
DP#.2	Resource of de...
DP#.3	Schedule-mana...
DP#.4	Data structure f...
DP#.5	ECO handling t...

FIG. 48A

#: 1.2.3	FR	DP
Parent	Parent FR description	Parent DP description
#.1	FR 1 description	DP 1 description
#.2	FR 2 description	Alternative DP 2(a) Alternative DP 2(b) Alternative DP 2(c)
#.3	FR 3 description	DP 3 description

FIG. 48B

Constraint Information:						
Num...	Descr...	FR#.	FR#.	FR#.	FR#.	FR#.
C#.1	Make...	X	X	X	X	X
C#.2	Supp...	X	X	X	X	X
C#.3	Elimi...	X	X	X	X	X
C#.4	Facilit...	X	X	X	X	X
C#.5	Funct...		X	X	X	
C#.6	Obie...			X	X	

FIG. 49A

Mapping Constraints		Robust Design		Analysis	
Index	Information	Constraints	Comments	Operator	Target value
1	Critical	Mark	Y	Less than (<+)	300lb
2	Interface	Field		More than(=)	\$500
3	Project	Manu	Y	Exact (=+/-)	10cu

	C#.1	C#.2	C#.3	CA's
FR#.1	X			Y
FR#.2	X	X		Y
FR#.3	X		X	Y
FR#.4	X			Y

FIG. 49B

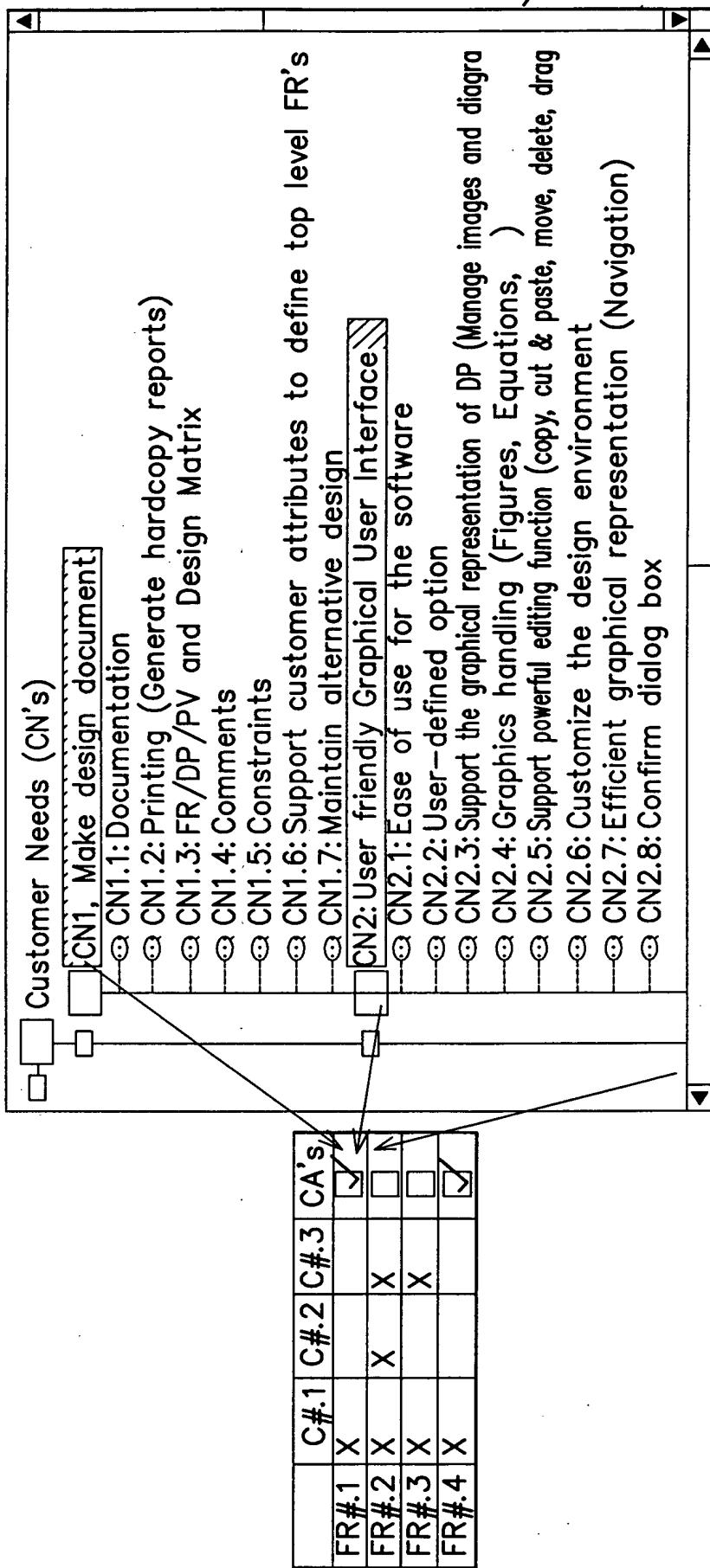


FIG. 50

Index #	Information			Comments	Operator	Target Value	Calculated
	Category	Type	Constraints				
1	Critical	Market	Weight	<input checked="" type="checkbox"/>	Less than (<+)	300lb	
2	Interface	Field	Cost	<input type="checkbox"/>	More than (>=)	\$500	
3	Project	Manu	Volume	<input checked="" type="checkbox"/>	Exact (=+/-)	10cu	

FIG. 51

<input checked="" type="checkbox"/> Edit Functional Requirements X	
<p>The Current Functional Requirement is:</p> <p>Please start with VERB for description.</p>	
<p>Data Input</p>	
<p>Description:</p>	<input type="text" value="Support user friendliness of the software"/>
<p>Keyword:</p>	<input type="text" value="User friendly"/>
<p>Comment:</p>	<p>The GUI is one of the most important features of the AD software. The design of the GUI will be discussed later.</p>
<p>Template: <input type="checkbox"/> <u>Process</u></p>	<p>Verification: <input type="text" value="Testing"/></p>
<p><input checked="" type="checkbox"/> <u>Clean</u> <input type="checkbox"/> <u>Insert</u> <input type="checkbox"/> <u>Append</u> <input type="checkbox"/> <u>Change</u> <input type="checkbox"/> <u>Delete</u> <input type="checkbox"/> <u>Cancel</u></p>	

FIG. 52A

Parent Information		
Num...	Description	Comment
FR 1	Make a decision-making tool which...	A software tool for decision making...
DP 1	Computerized system with the Axiomatic Design.	Software for Axiomatic Design.
FR Information:		
Num...	Description	Comment
FR#1	Manage design...	The design a...
FR#2	Provide decisions...	The FR deal...
FR#3	Support user...	The GUI is a...
FR#4	Provide efficiency...	All kinds of d...
FR#5	Provide utility...	The fundam...
DP Information:		
Num...	Description	Comment
DP#1	Management ro...	Management ro...
DP#2	Decision-making...	Decision-making...
DP#3	Graphical User...	Graphical User...
DP#4	Data-managing...	Data-managing...
DP#5	Plug-in software	Plug-in software

FIG. 52B

Index	Template	FR	Information	DP	Comment	FR	DP	App. Link
Parent #	Control the FR/DP domain	FR/DP window				<input checked="" type="checkbox"/>	<input type="checkbox"/>	
1	Control the mapping	Mapping tab				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Assign constraints	Domain tab				<input type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Refine the design	Constraints tab				<input type="checkbox"/>	<input type="checkbox"/>	
4	Analyze the design	Robust design tab				<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Analysis tab				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

FIG. 52C

			DP1			DP2		
			DP11	DP12	DP13	DP21	DP22	DP23
FR1	FR11	FR111	X					
	FR112	X						
	FR12	FR121		X				
	FR122			X				
	FR13	FR131			X			
	FR132				X			
FR2	FR21	FR211				X		
	FR212					X		
	FR213						X	
	FR22	FR221	X	X	X	X	X	X
	FR222	X	X	X	X	X	X	X
	FR23	X	X	X	X	X	X	X

FIG. 53

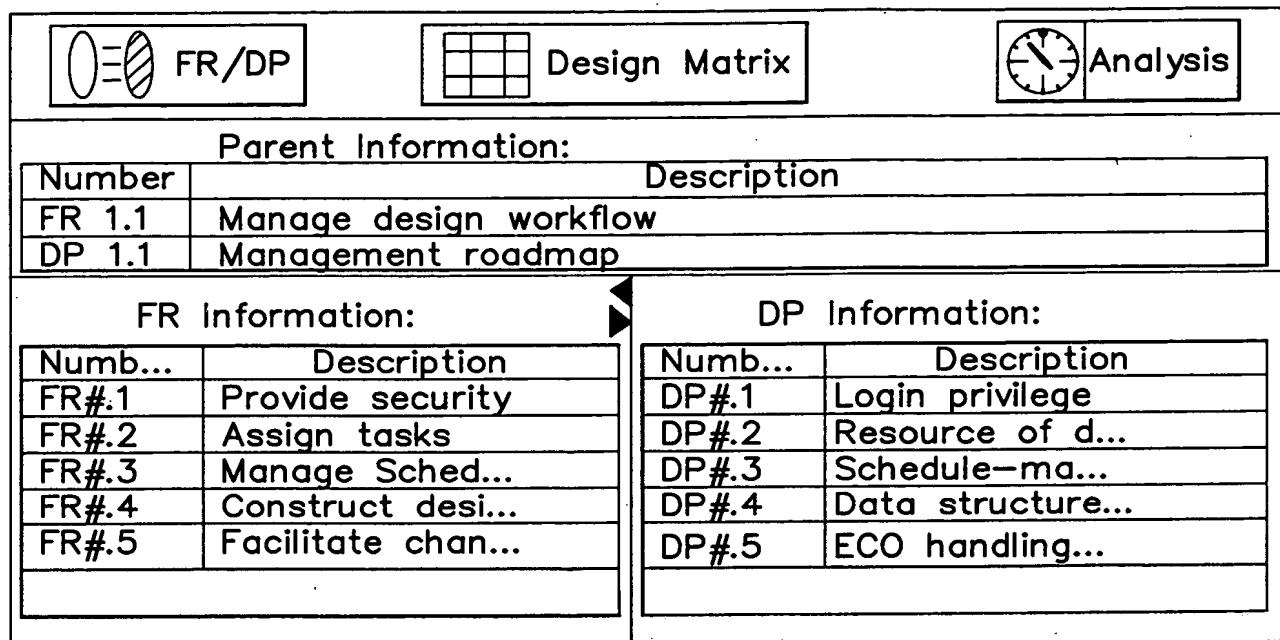


FIG. 54A

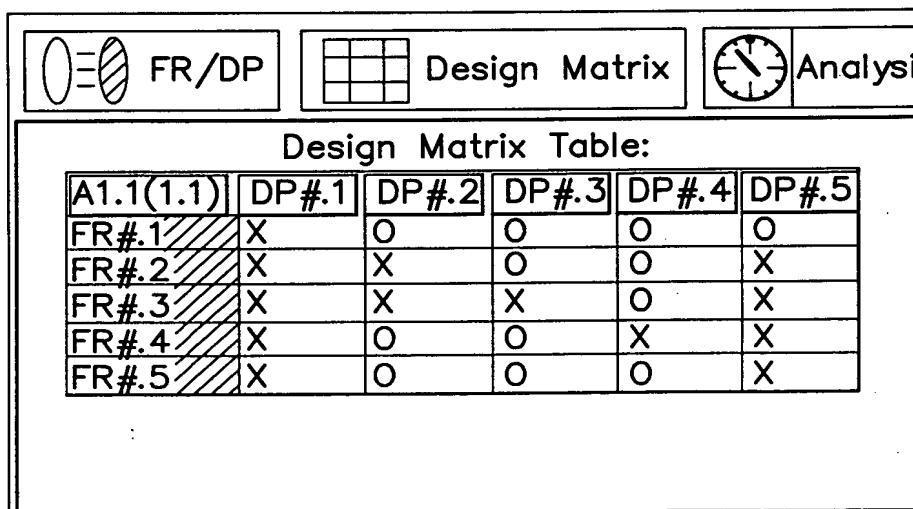


FIG. 54B

Mapping		Constraints		Robust Design		Analysis	
Index	Template	FR	Information	DP	FR	DP	Comment
#	Parent	Control the FR/DP domain	FR/DP window	Mapping tab	Mapping tab	DP	App. Link
Alt.	1	Control the mapping	FR/DP domain	Mapping tab	Mapping tab	DP	App. Link
∅	2	Assign constraints	Domain tab	Domain tab	Domain tab	DP	App. Link
3	3	Refine the design	Constraints tab	Constraints tab	Constraints tab	DP	App. Link
4	4	Analyze the design	Robust design tab	Robust design tab	Robust design tab	DP	App. Link
			Analysis tab	Analysis tab	Analysis tab	DP	App. Link

	DP#.1	DP#.2(a)	DP#.2(b)	DP#.3	DP#.4
FR#.1	X				
FR#.2	X	X	X		
FR#.3	X		X	X	
FR#.4	X			X	X

Cmt	0	?	/	Δ
0	X			
?				
/				
Δ				

FIG. 54C



FIG. 55A

TOP SECRET//SI//REL TO USA, UK, FVEY



FIG. 55B

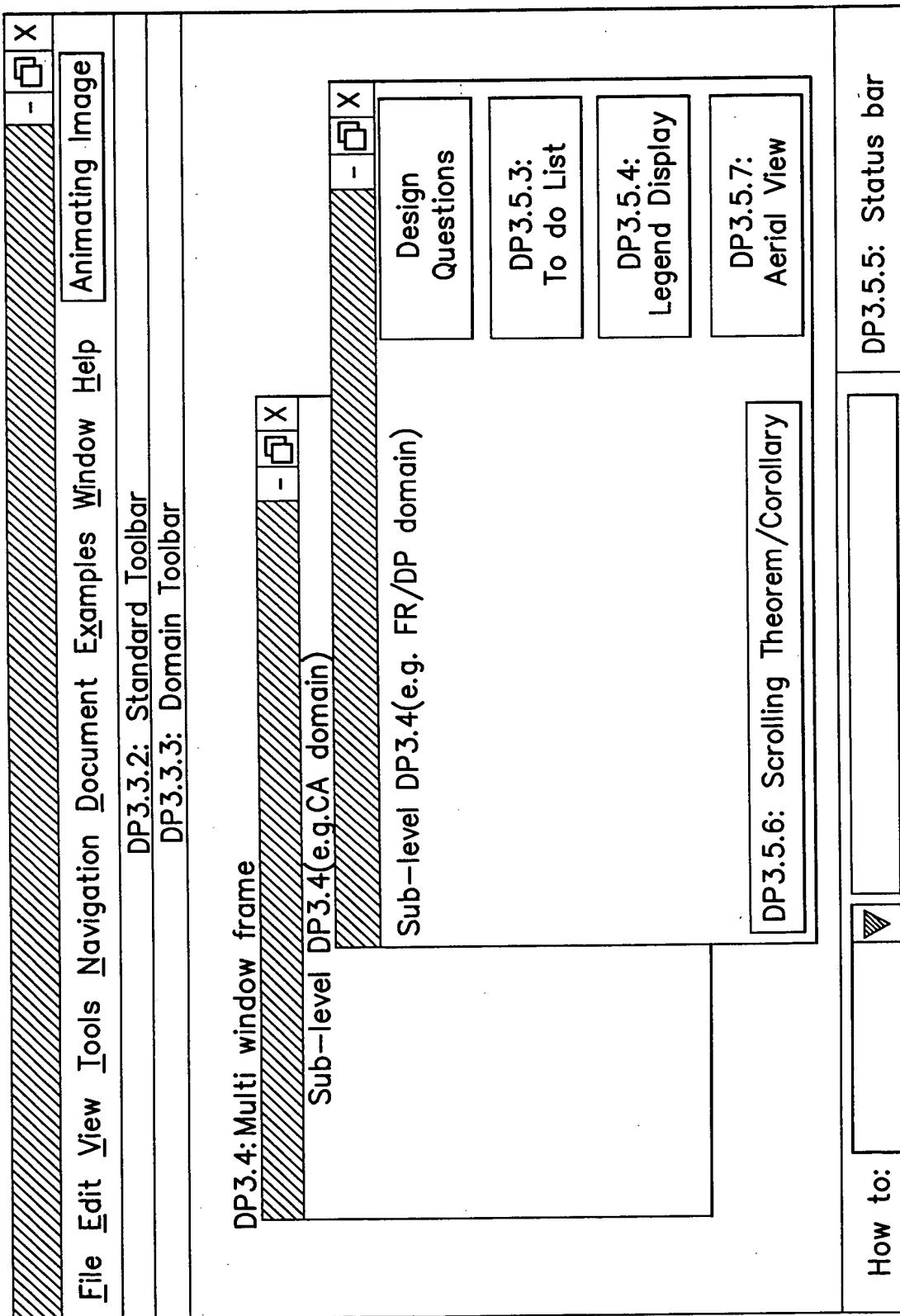


FIG. 56

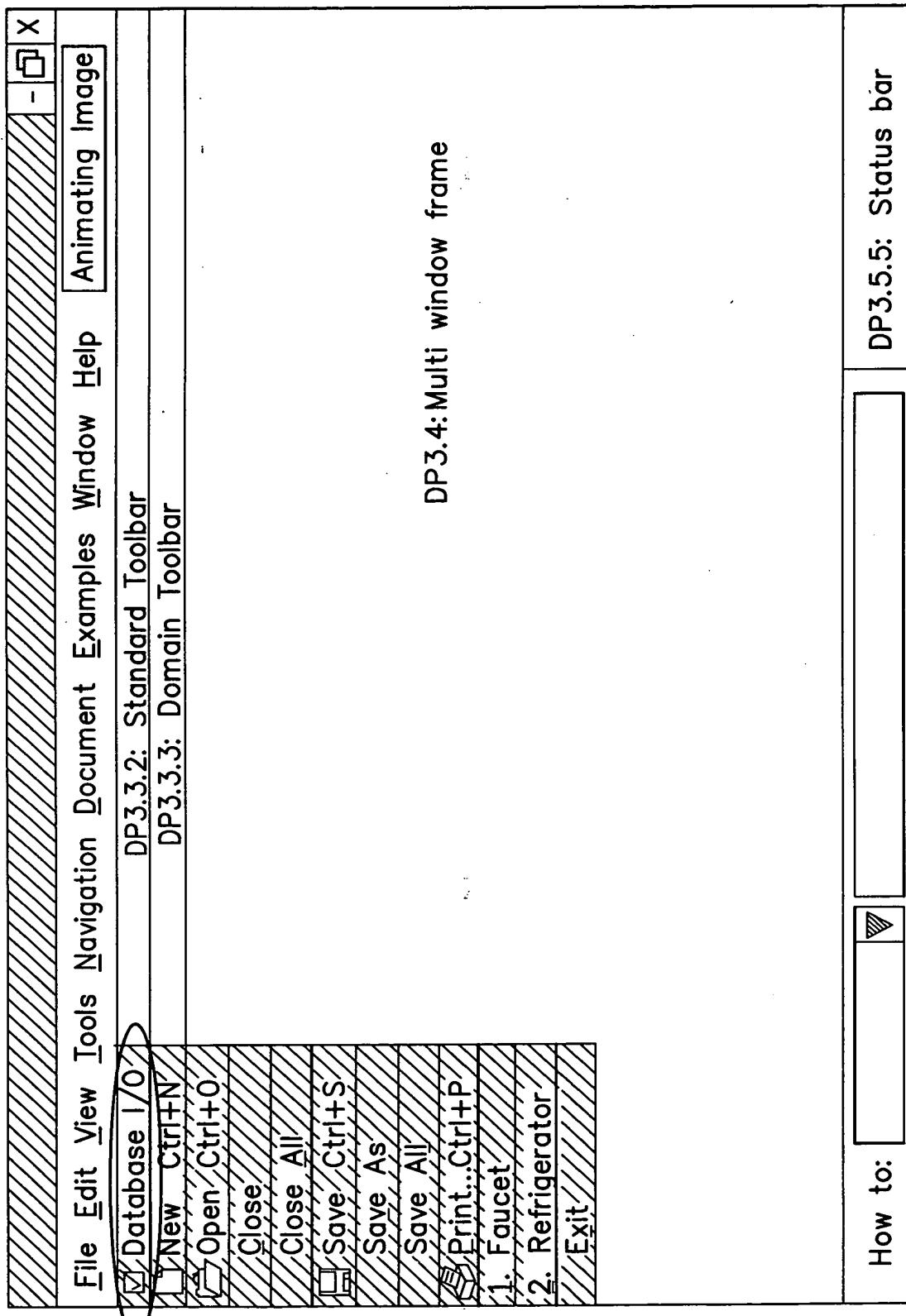
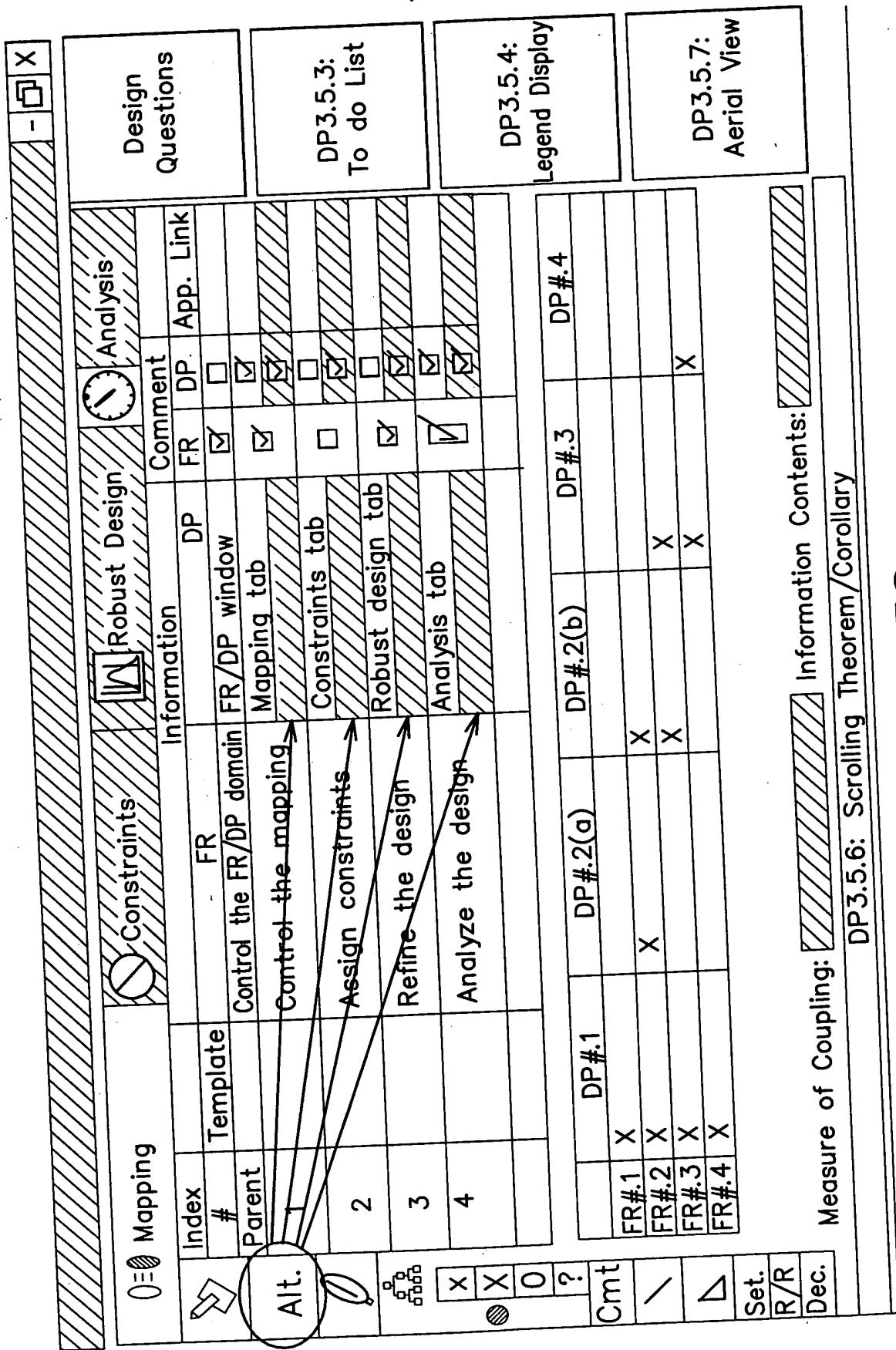


FIG. 57



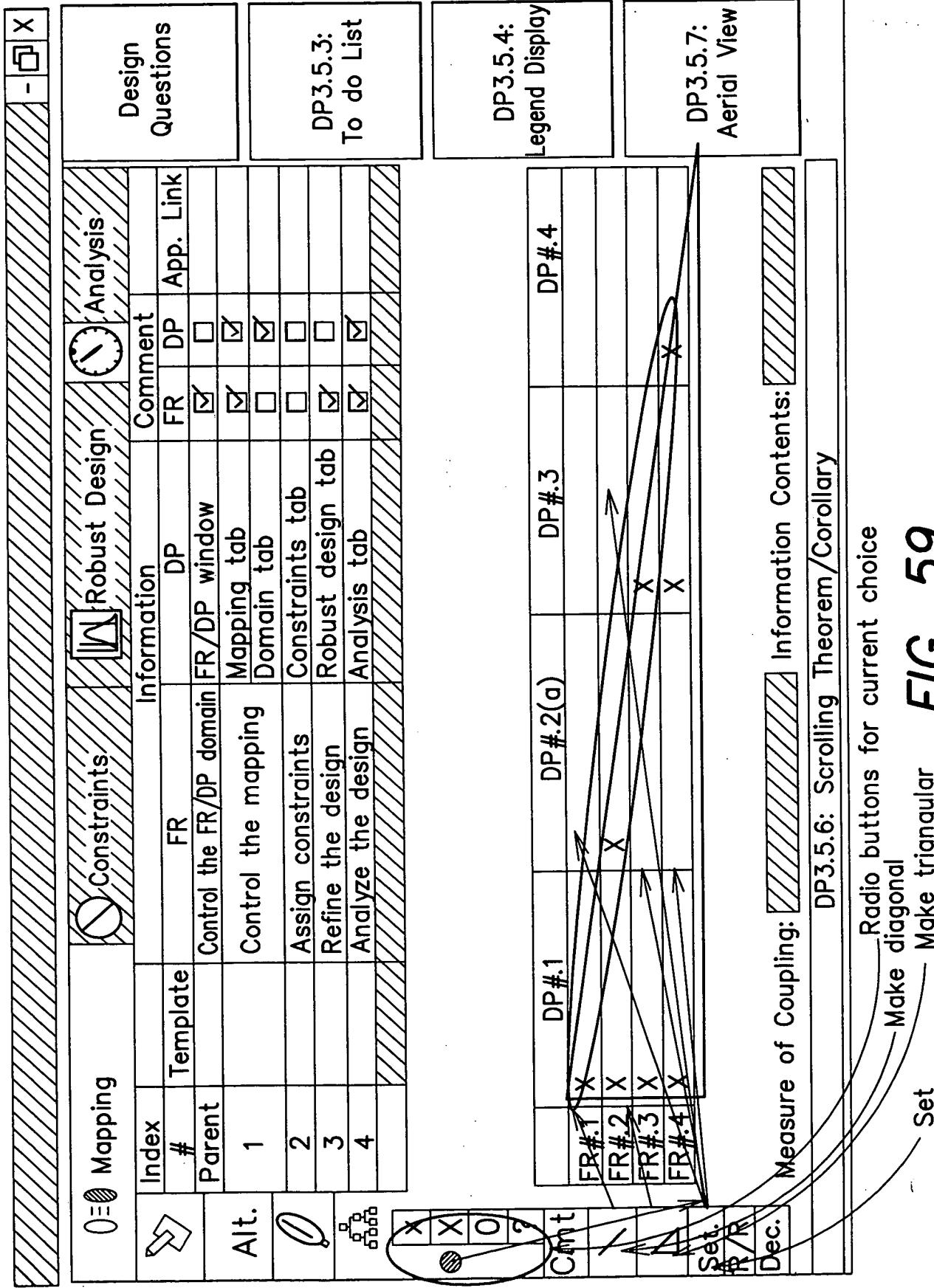


FIG. 59

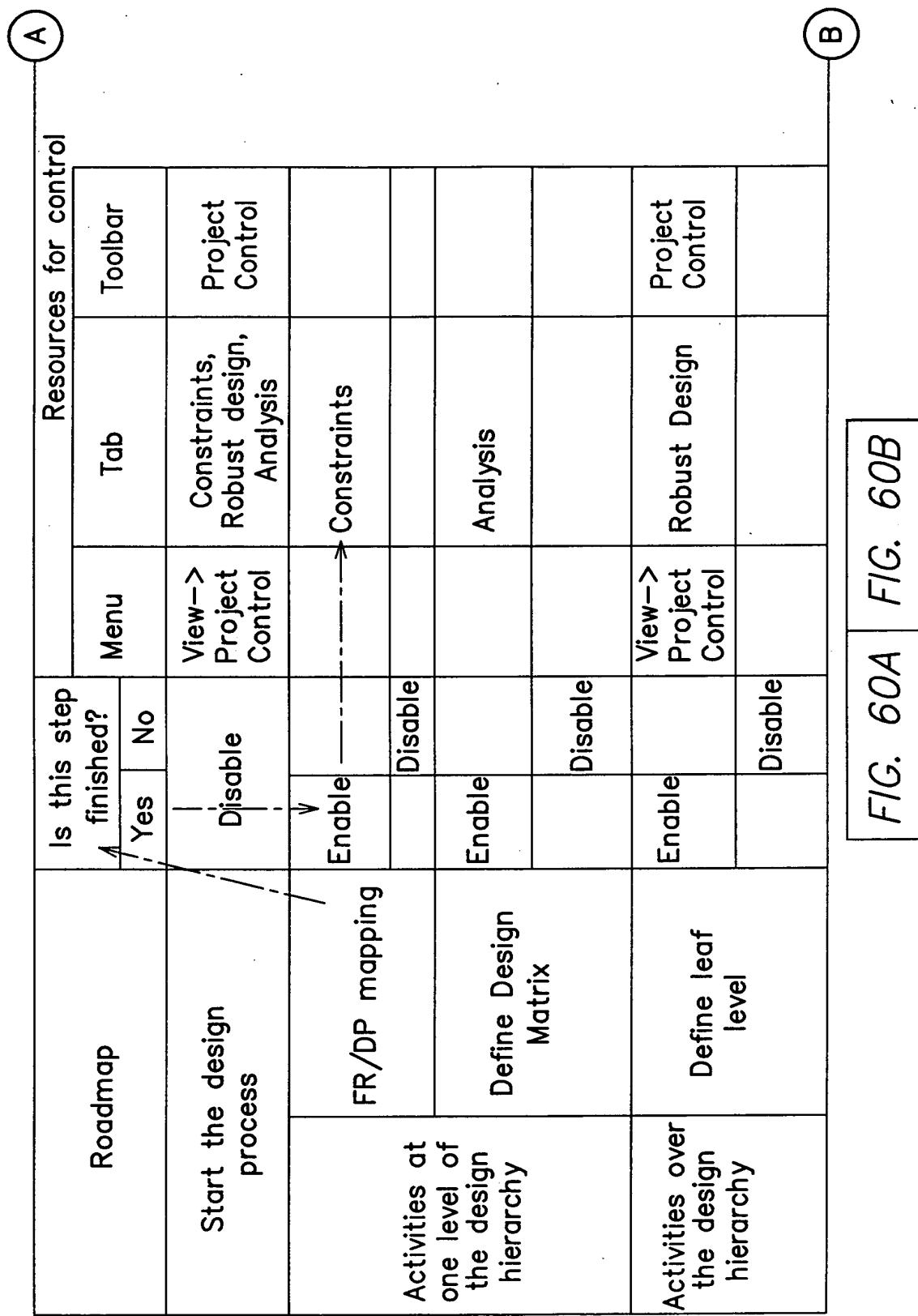


FIG. 60A

Resources for control			
In Mapping tab	In Constraint tab	Buttons	In Analysis tab
			In Robust Design
One step design matrix control buttons			
Decompose		Flow Chart, Impact List, Check consistency	
Decompose		Flow Chart, Impact List, Check consistency	
		Check Constraints, Audit	
		Check Constraints, Audit	

FIG. 60B

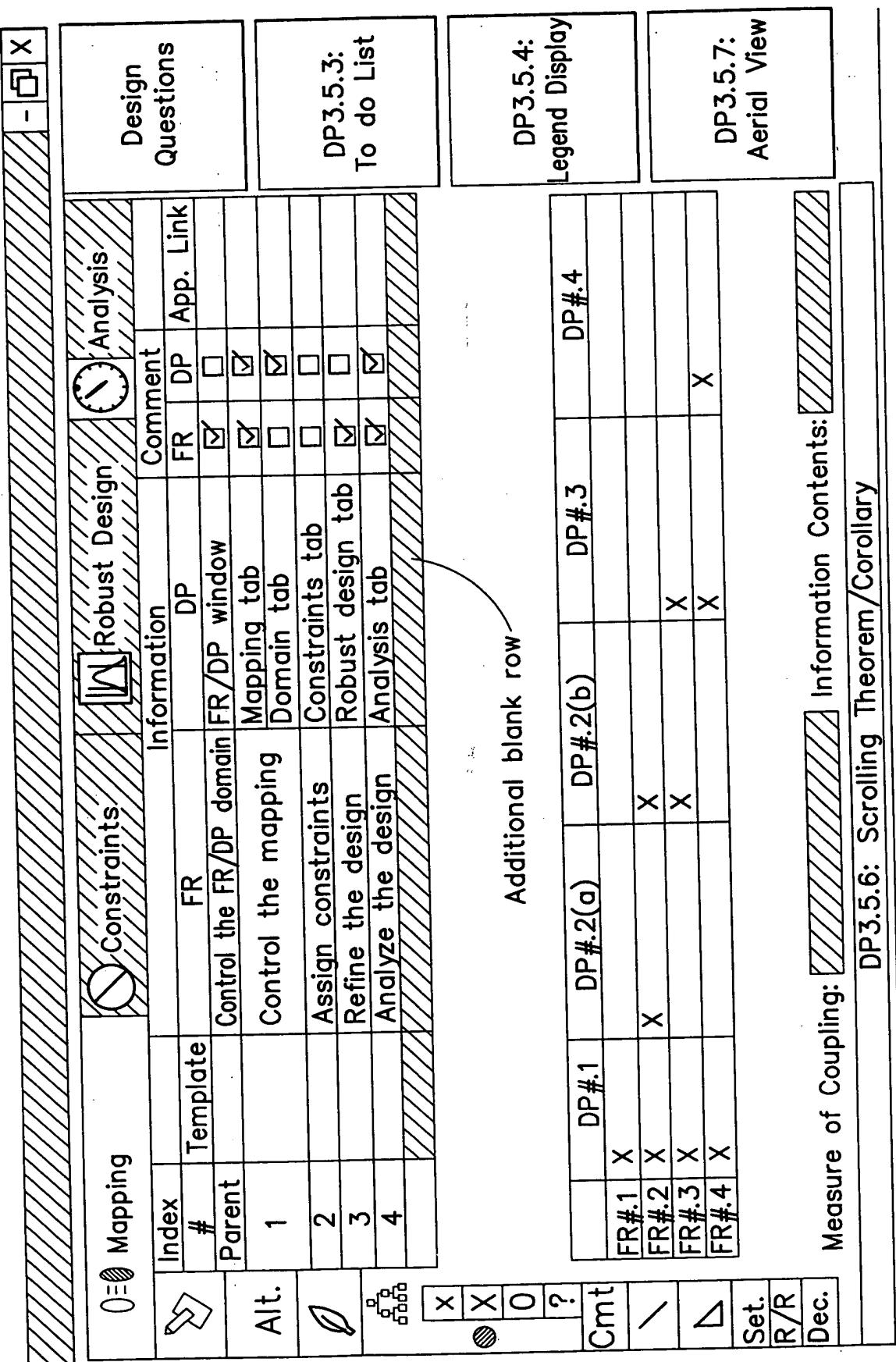


FIG. 61

Mapping		Constraints		Robust Design		Analysis		Design Questions			
Index #	Template	FR	Information	DP	FR/DP	Window	Comment	FR	DP	App.	Link
Parent	Control the FR/DP domain	Mapping tab	Mapping tab	☒	☒	☒					
Alt. 1	Control the mapping	Domain tab	Domain tab	☒	☒	☒					
Alt. 2	Assign constraints	Constraints tab	Constraints tab	☒	☒	☒					
Alt. 3	Refine the design	Robust design tab	Robust design tab	☒	☒	☒					
Alt. 4	Analyze the design	Analysis tab	Analysis tab	☒	☒	☒					
Icon											
?											
Cmt											
/											
△											
Set.											
R/R											
Dec.											

Information Contents: []

DP#4: Measure of Coupling: []

DP#5: Scrolling Theorem/Corollary []

DP#6: Aerial View []

DP#7: Aerial View []

FIG. 62

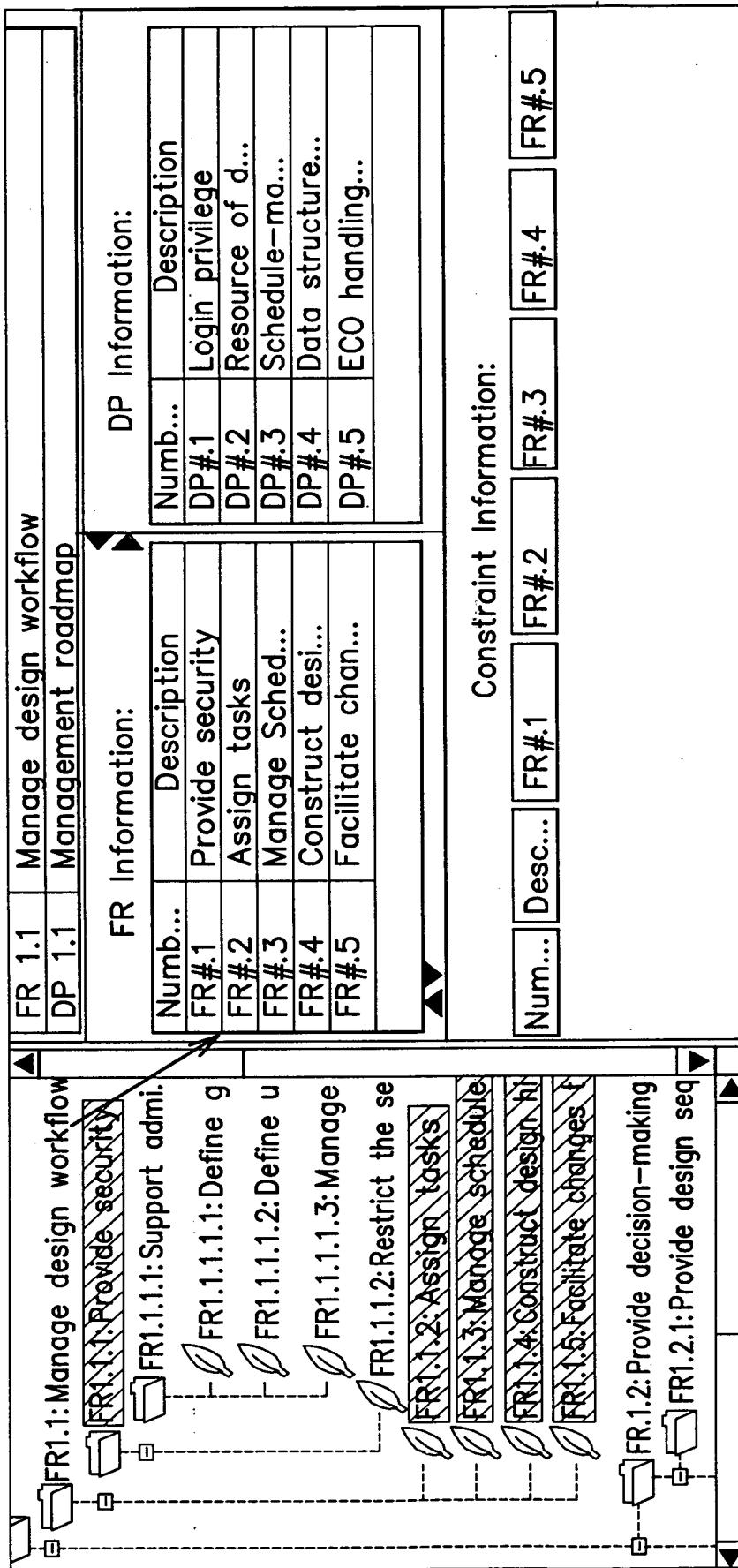


FIG. 63A

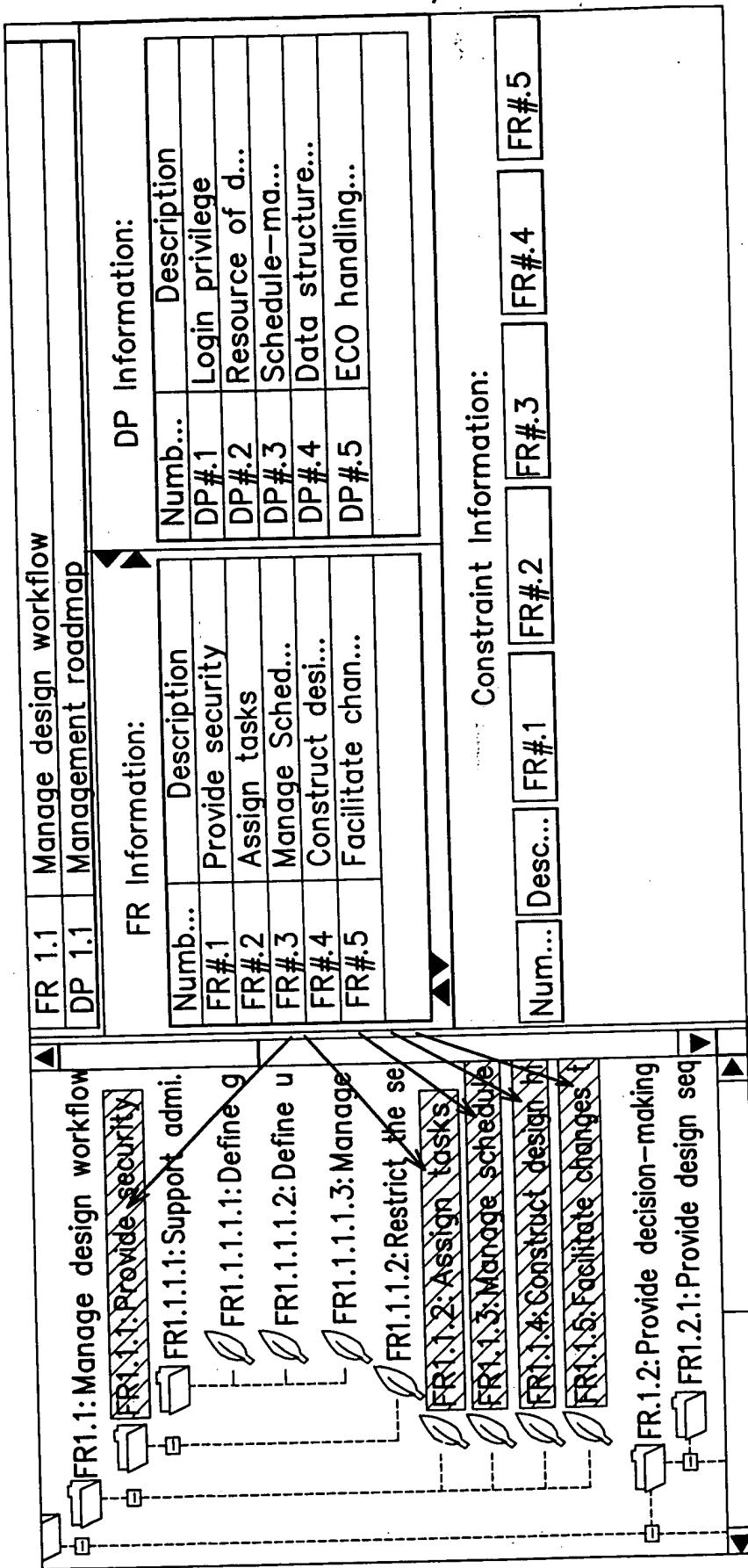


FIG. 63B

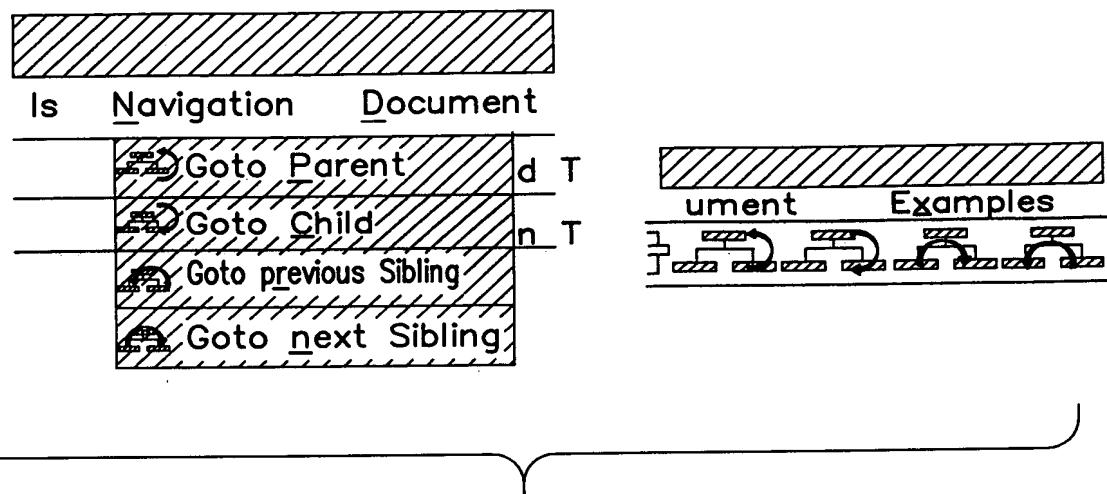


FIG. 64

Control Item	Level 1	Level 2	Level 3	Level 4	Level 5
	Beginner	Intermediate	Expert		
FR/DP Mapping	●	●	●	●	●
Design Matrix	●	●	●	●	●
Alternative DP	●	●	●	●	●
Analysis–Flow Chart	●				
Constraints	●	●	●	●	●
Comments					
CN					
CN/FR Mapping					
Analysis–Child List					
Analysis–Impact List					
DP/PV Mapping					
Analysis–Check Consistency					
Analysis–Check Constraints					
Templates					
Verification					
Application Link					
Analysis–Audit					
Nested(Full) Matrix Handling					
Robust Design					
Project Control					

Available Features

(A)

FIG. 65A
FIG. 65B
FIG. 65C

FIG. 65A

(B)

卷之三

Automatic Menu Control (Enables the marked item)

FIG. 65B

1

Automatic Window Control (Displays the marked item)									
FR/DP Window	No Tab	Mapping Tab	Constraints Tab	Robust Design Tab	Flow Chart Tab	Child List Tab	Impact List Tab	Check Consistency Tab	Check Constraints Tab
	●								
		●							
		●	●						
			●						
				●					
					●				
						●			
							●		
								●	

FIG. 65C

	Numeric	Default Numbering	Alternative Numbering	Example
Numbering Type	Numeric Lower case Upper case	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	1, 2, 3 a, b, c A, B, C
Indicator	Alternative connector Parent index Divider			Defined by user
		#=1 [FR 1] Example	#=1 [DP 1] #=1.2 [FR#1 FR#2] #=1.2 [DP#1 DP#2] #=1.2 [DP#1 DP#2] #=1.2 [DP#1 DP#2] #=1.2 [DP#1 DP#2]	

FIG. 66

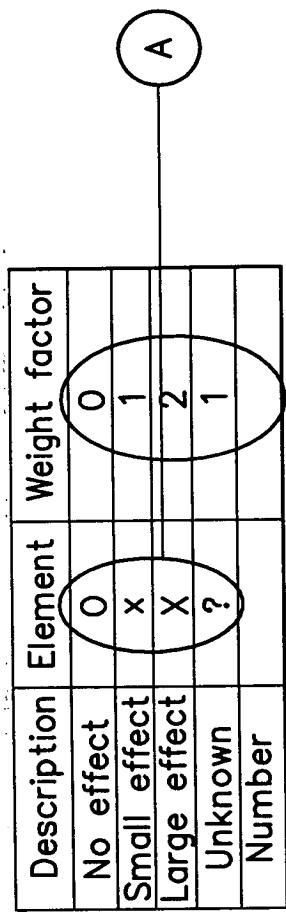


FIG. 67A FIG. 67B

FIG. 67A

FIG. 67B

		Legend category		
		Color	Font	Line
Display	Activated cell			N/A
	Normal			
	Default			N/A
	Focus	Diagonal lines		N/A
	Alternative	Diagonal lines		N/A
	Redundant	Diagonal lines		N/A
	Constraints			N/A
	Comments	Diagonal lines		N/A
Design Matrix	Uncoupled	Diagonal lines		N/A
	Decoupled	Diagonal lines		N/A
	Coupled	Diagonal lines		N/A
	Undefined	Diagonal lines		N/A
Template	Process			—
	Transport			----
	...			

FIG. 68

94/127

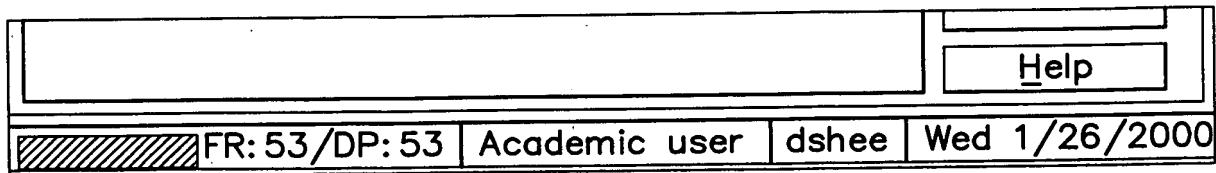


FIG. 69

00000000000000000000000000000000

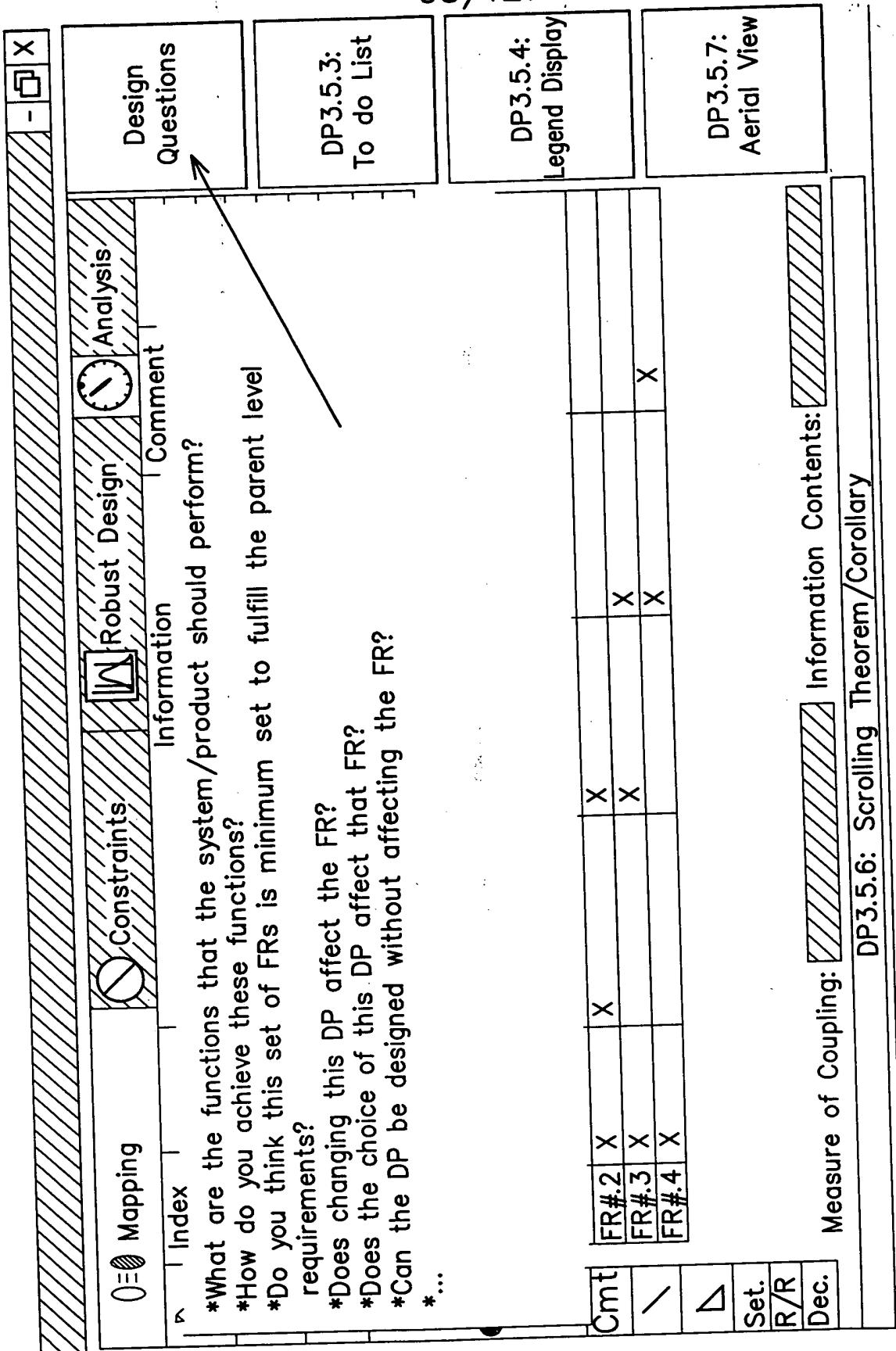


FIG. 70

Mapping		Constraints	Robust Design	Analysis	Design Questions	
Index	#	Template	FR	Information	Comment	
Parent		Control the FR/DP domain	FR/DP window	DP	FR	DP
Alt.	1	Control the mapping	Mapping tab	☒	☒	☒
			Domain tab	☐	☒	☒

*Due to the changes on DP xx, you have to check the impacts.
 *You didn't fill out the Design Matrix information at FR 1.2.x node.
 *You didn't fill out the constraint information on this node.
 *You didn't set up the relation for FR and CA.
 *...

DP3.5.3:
 To do List

DP3.5.4:
 Legend Display

DP3.5.7:
 Aerial View

DP3.5.6: Scrolling Theorem/Corollary

Information Contents:

FIG. 71

Rank/Rearrange the Design Matrix combination... X

Matrix Information:

A0(1.1)	DP: #.1	DP: #.2(1)
FR: #.1	X	O
FR: #.2	O	X

Ranking Information:

FR: #.1	FR: #.2	Status	Off X's	Coupled X's
DP: #.1	DP: #.2(1)	Uncoupled	0/4	n/a
DP: #.2	DP: #.2(1)	Uncoupled	0/4	n/a
DP: #.1(1)	DP: #.2(1)	Decoupled	1/4	n/a
DP: #.1(1)	DP: #.2	Decoupled	1/4	n/a
DP: #.1	DP: #.2(2)	Decoupled	1/4	n/a
DP: #.1(1)	DP: #.2(2)	Coupled	2/4	1

Rearrange Sequence:

Rearranged FR Order	
No Rearrange	
FR: 1-FR: 2-	
FR: 2-FR: 1-	

DP Ranking Assumptions

- Start FR/DP association
- Free association of DPs

Get Rank Combination

Display Options

- Number
- Description
- Keyword

Colors

Unknown	Design
Uncoupled	Design
Decoupled	Design
Coupled	Design
Alternative	Design
Redundant	Design
Has Component	Design

Design Matrix Table:

A0(1.1)	DP#.1	DP#.1(1)	DP#.2	DP#.2(1)	DP#.2(2)
FR#1	X	X	O	O	X
FR#2	O	X	X	X	X

Help

FIG. 72

Child List	Impact List	Inconsistency	Decoupling	DP Description
Number		FR Description		
1.1		Manage design workflow		Management roadmap
1.1.1		Provide security		Login privilege
1.1.2		Assign tasks		Resource of design activity
1.1.3		Manage schedule		Schedule-managing tool (e.g. MS Project)
1.1.4		Construct design hierarchy		Data structure for Axiomatic Design concept
1.1.5		Facilitate changes to the design		ECO handling tool
1.1.1.1		Support administrative tool		User manager
1.1.1.2		Restrict the security access level		Authority code
1.1.1.1.1		Define group		Group specification
1.1.1.1.2		Define user		User specification
1.1.1.1.3		Manage authority code		Authority code specification

FIG. 73

Design Matrix Table:

		DP# .1	DP# .2	DP# .3	DP# .4	DP# .5
A1(1.1)	DP# .1	0	0	0	0	0
FR# .1	X	X	X	X	X	X
FR# .2	X	X	0	0	0	0
FR# .3	X	X	X	X	0	0
FR# .4	X	X	0	X	0	0
FR# .5	0	0	0	X	X	X

Child List **Impact List** **Inconsistency** **Decoupling**

Number	FR Description	DP Description
1.4.1	Support data file	File handling
1.4.2	Support database	Database handling
1.4.2.1	Provide consistency during data read a...	Data file format
1.4.2.2	Control error during read/write	Exception handling
1.4.2.3	Convert data from old version	Data file converter
1.4.2.4	Read data	Method for read
1.4.2.5	Write data	Method for write
1.4.2.6	Provide utility to deal with the program...	Method for utility
1.5	Provide utility function	Plug-in software
1.5.1	Handle external applications	Standard interface for external appli...
1.5.2	Teach the axiomatic design concept	Education software
1.5.3	Simulate the system architecture	Simulation software
1.5.4	Draw the Design Parameter figure	CAD Software
1.5.5	Analyze the system performance	Analysis software(i.e. ANSYS, NAS...)
1.3	Support user friendliness of the software	Graphical User Interface software

Get data

Display Options

- Number
- Description
- Keyword

Colors

- Uncoupled Design
- Decoupled Design
- Coupled Design
- No Effect
- Has Effect
- Has Comment

[Help](#)

		Design Matrix Table:					
		DP#1	DP#2	DP#3	DP#4	DP#5	DP#6
A1.4.2...	DP#1	0	0	0	0	0	0
FR#1	X	X	X	X	X	X	X
FR#2	0	X	X	X	X	X	X
FR#3	X	X	X	X	X	X	X
FR#4	X	X	X	X	X	X	X
FR#5	X	X	X	X	X	X	X
FR#6	0	0	0	0	0	0	0

Flowchart:

```

graph TD
    M6[M: #.6] --- M4[M: #.4]
    M6 --- M3[M: #.3]
    M4 --- M3
    M3 --- M5[M: #.5]
    M5 --- M2[M: #.2]
    M5 --- M1[M: #.1]
    M2 --- M1
  
```

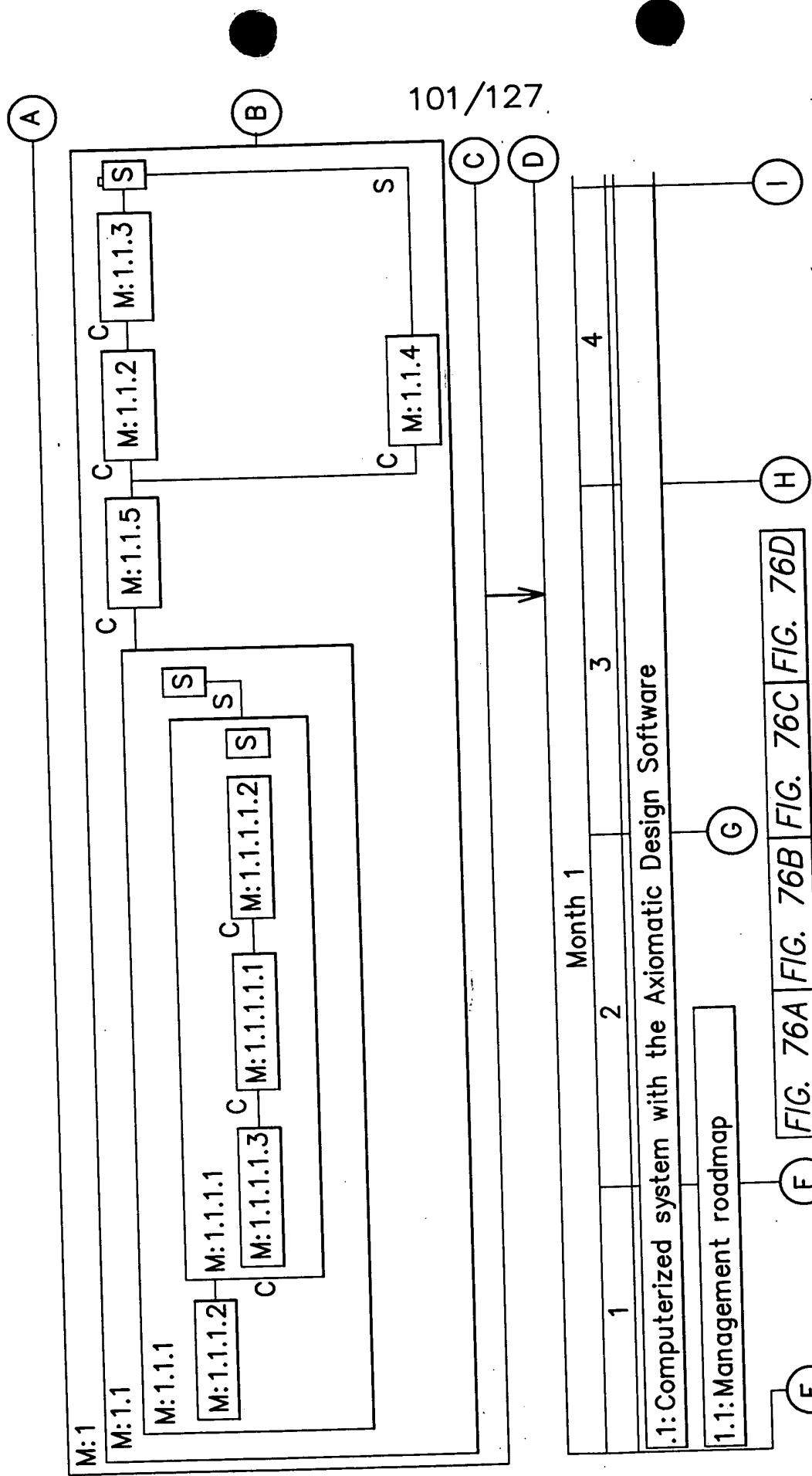


FIG. 76A

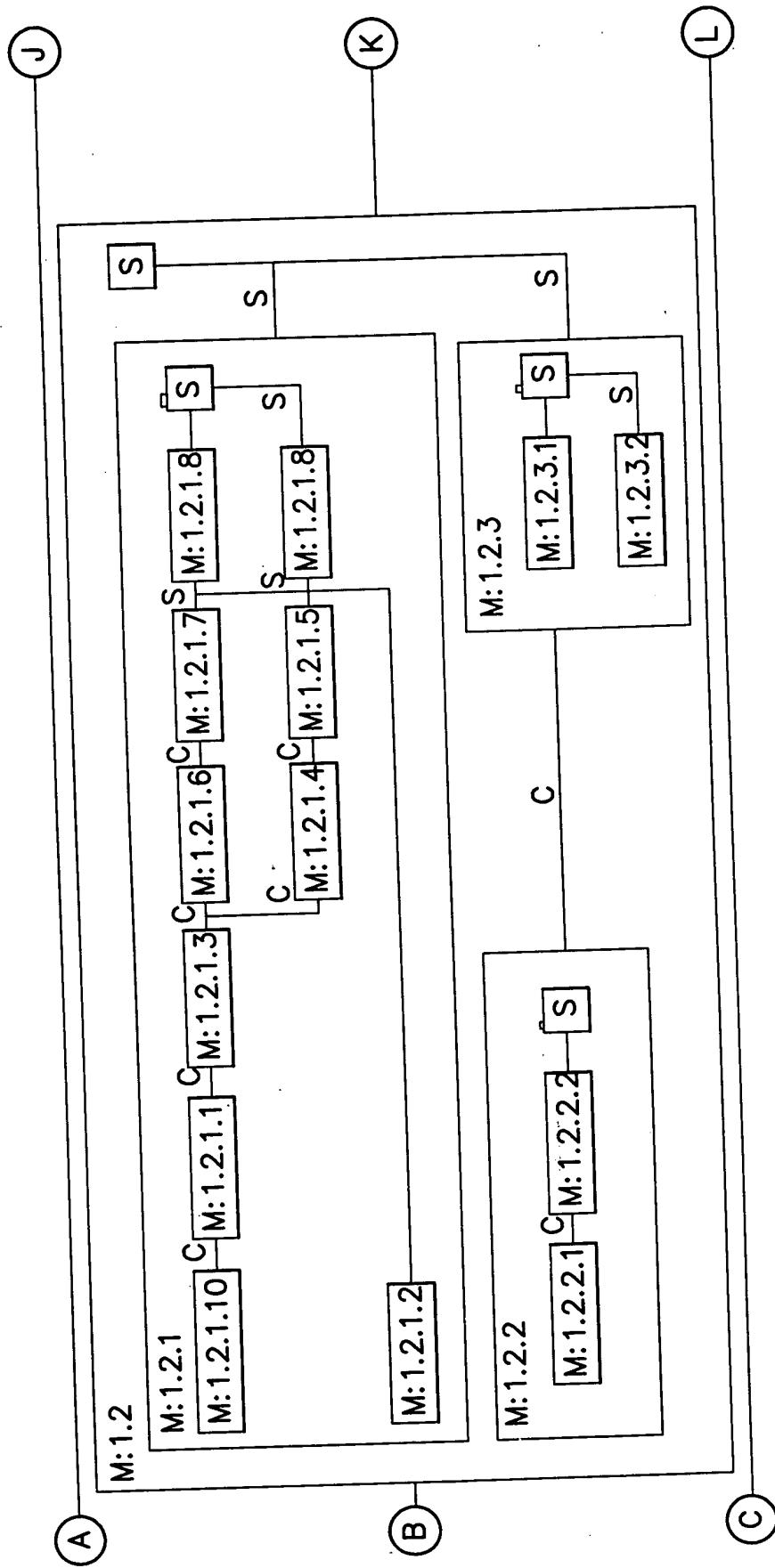


FIG. 76B

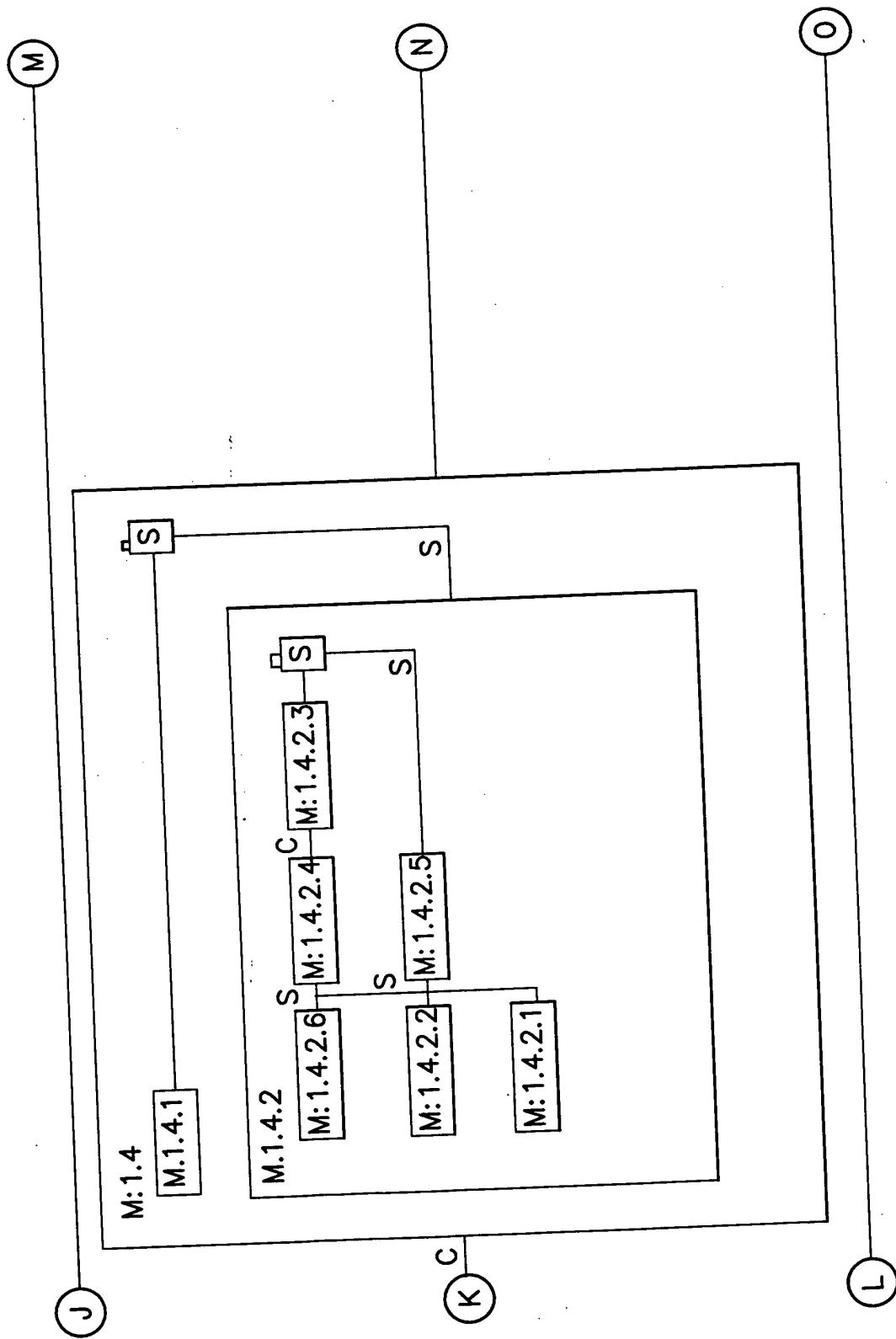


FIG. 76C

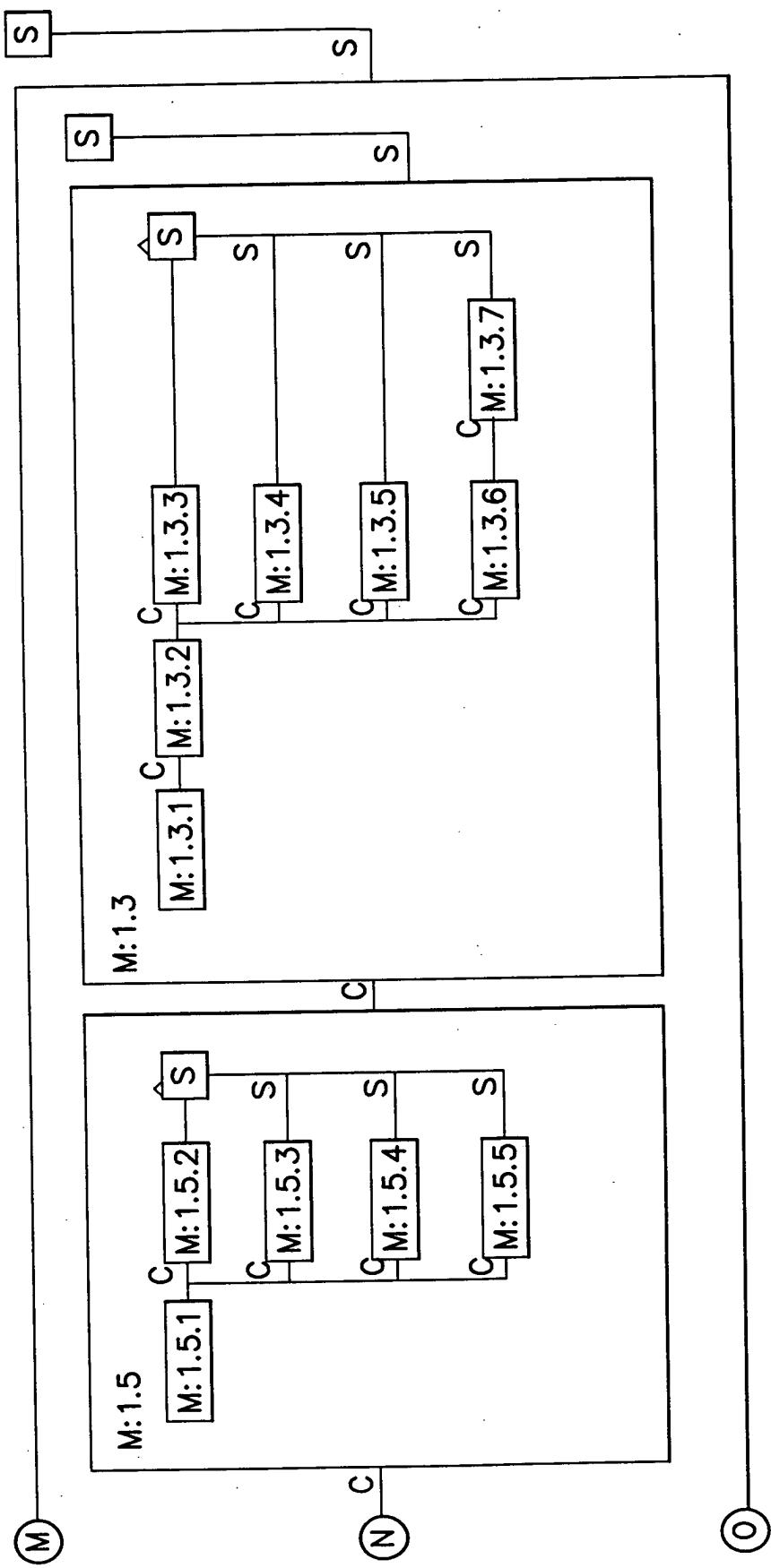


FIG. 76D

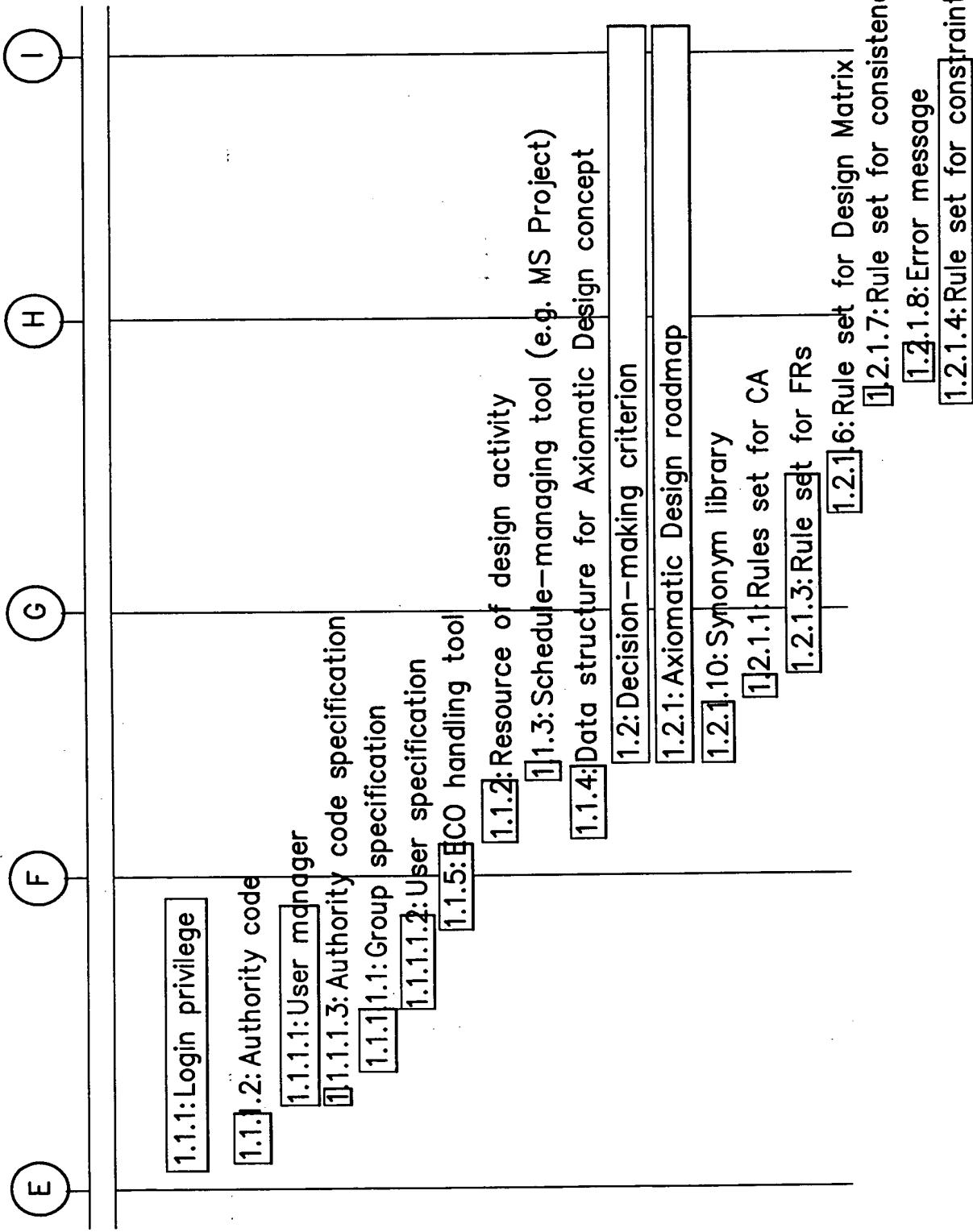


FIG. 76E

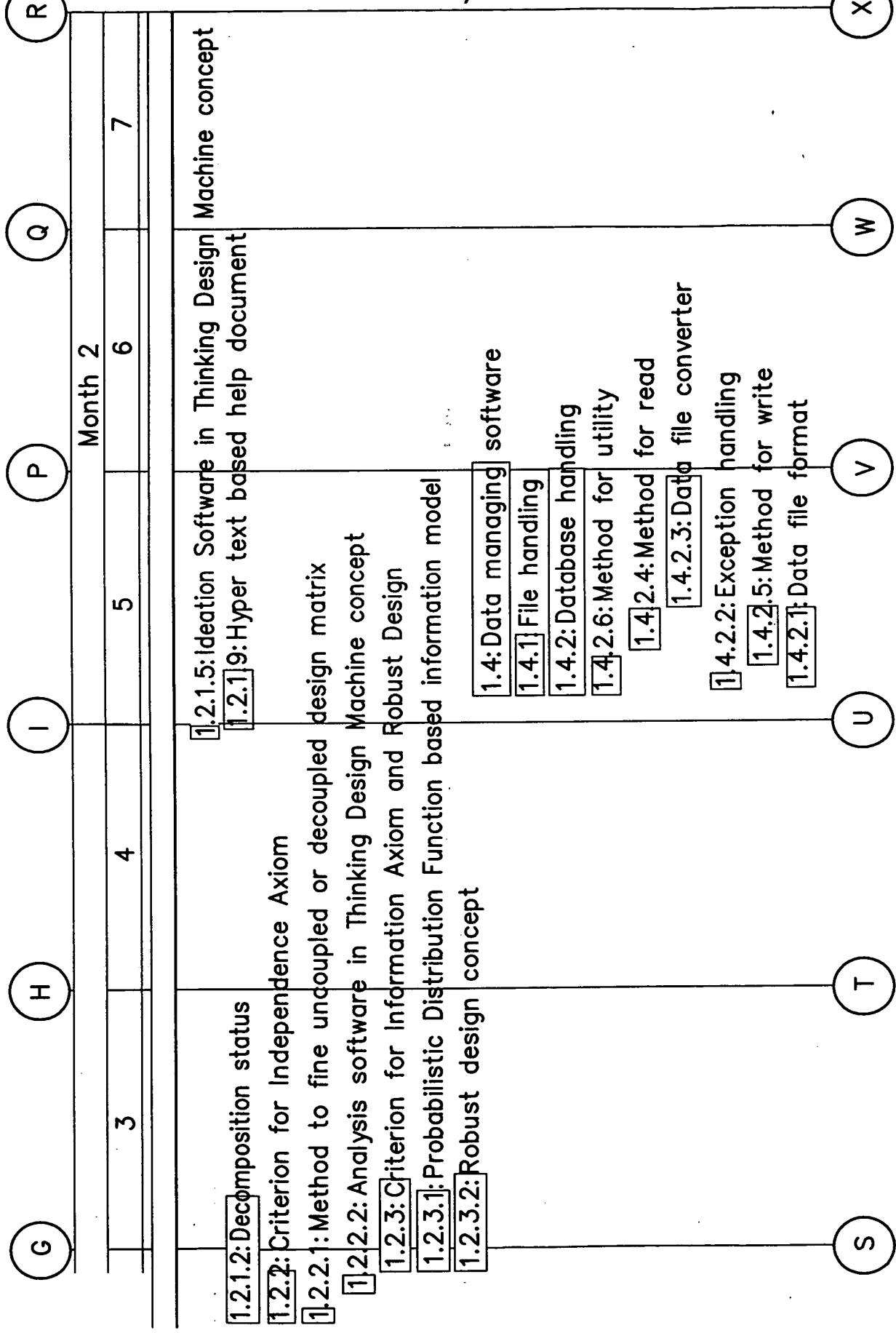


FIG. 76F

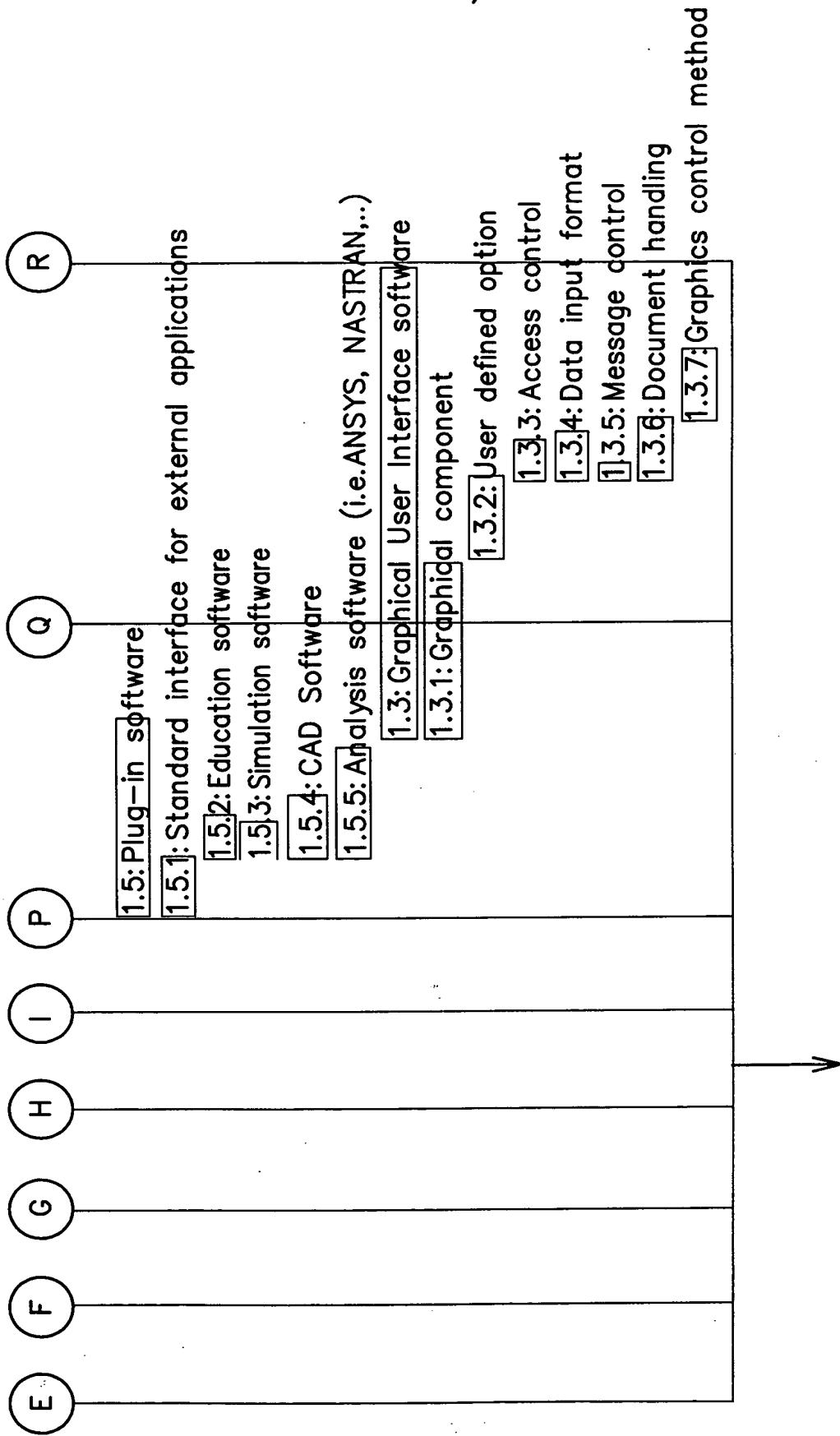


FIG. 76G

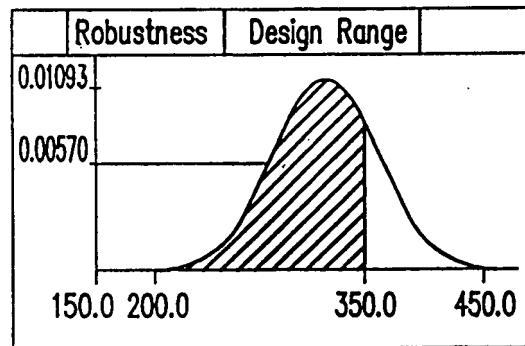


FIG. 77A

CONFIDENTIAL - DRAFT

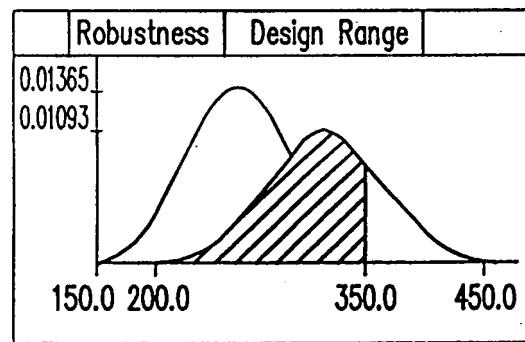


FIG. 77B

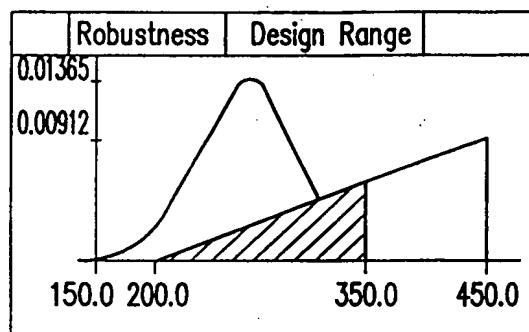


FIG. 77C

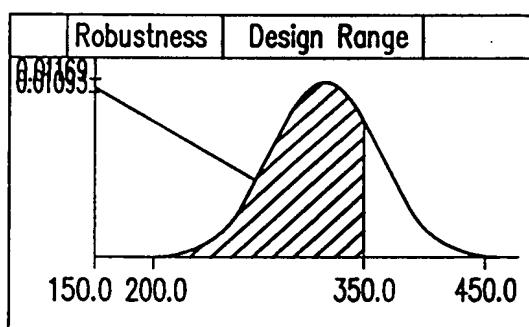


FIG. 77D

FR/DP TABLE		Design Document for Printing...		
Index: 1				
No.	Name	Functional Requirements (FRs)	Design Parameters (DPs)	Verification
P.				▲
1	Process	Manage design workflow	Management roadmap	Testing
2	Process	Provide decision-making environment	Decision-making criterion	Testing
3	Process	Support user friendliness of the software	Graphical User Interface software	Testing
4	Process	Provide efficient data I/O	Data-managing software	Testing
5	Process	Provide utility function	Plug-in software	Testing

X

PRINT
Print ALL
Page Setup
SAVE
QUIT

A

B

FIG. 78A

FIG. 78A
FIG. 78B

(A)

Total Design Matrix Information

	DP.#.1	DP.#.2	DP.#.3	DP.#.4	DP.#.5
FR.#.1	X	O	O	O	O
FR.#.2	X	X	O	O	O
FR.#.3	X	X	X	X	X
FR.#.4	X	X	O	X	O
FR.#.5	O	O	O	X	X

Related Constraints

No	Parent	Keyword	Description	Comment					Verification
				1	2	3	4	5	
1	Designer	Impact	Make Impacts	*	*	*	*	*	Testing
2	Marketing	Speed	Support running as fast as possible		*	*	*	*	Testing
3	Designer	Bug	Eliminate bugs	*	*	*	*	*	Testing
4	Marketing	External Application	Facilitate use with external applications		*	*	*	*	Testing
5	Marketing	Multi-platform	Functions across platforms			*	*	*	Testing

(B)

Page Information	Page: 1
Document Format	
<input checked="" type="checkbox"/> Customer Needs <input type="checkbox"/> FR.DP.PV Table <input type="checkbox"/> FR.DP.PV Comment <input checked="" type="checkbox"/> Constraints <input checked="" type="checkbox"/> Design Matrix <input type="checkbox"/> Design Matrix Comment <input type="checkbox"/> Default Display <input checked="" type="checkbox"/> Full Display	
SET	

FIG. 78B

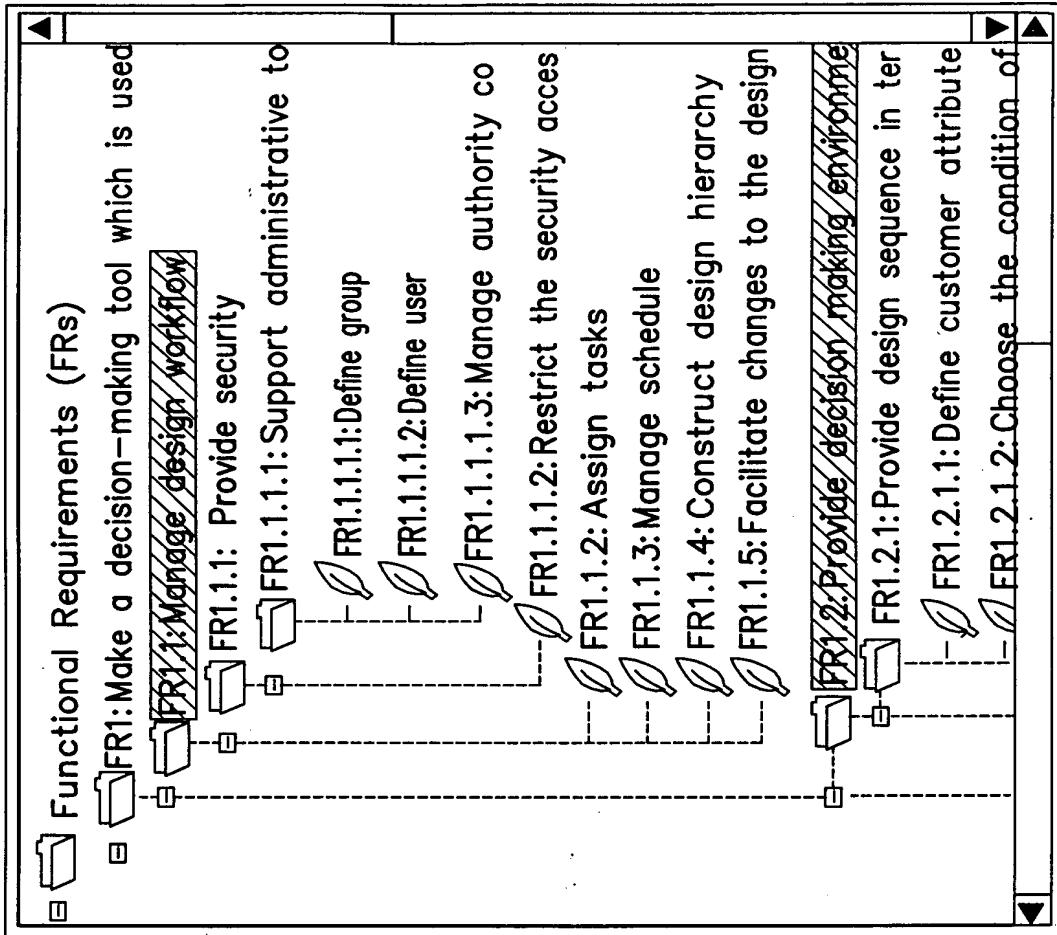


FIG. 79A

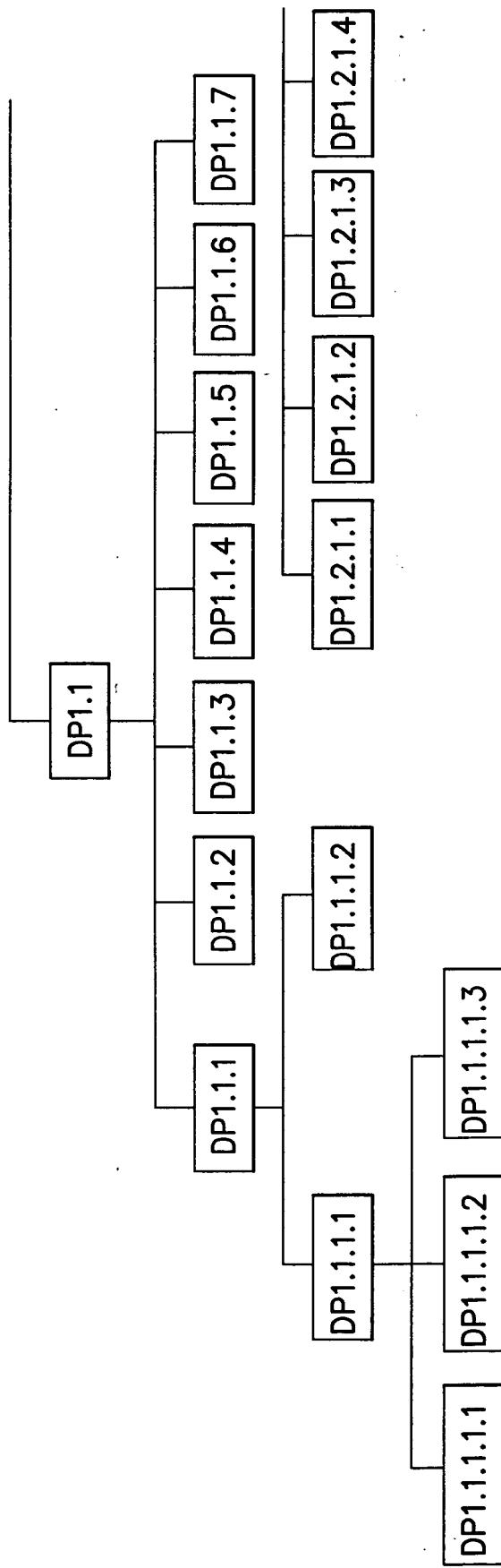


FIG. 79B

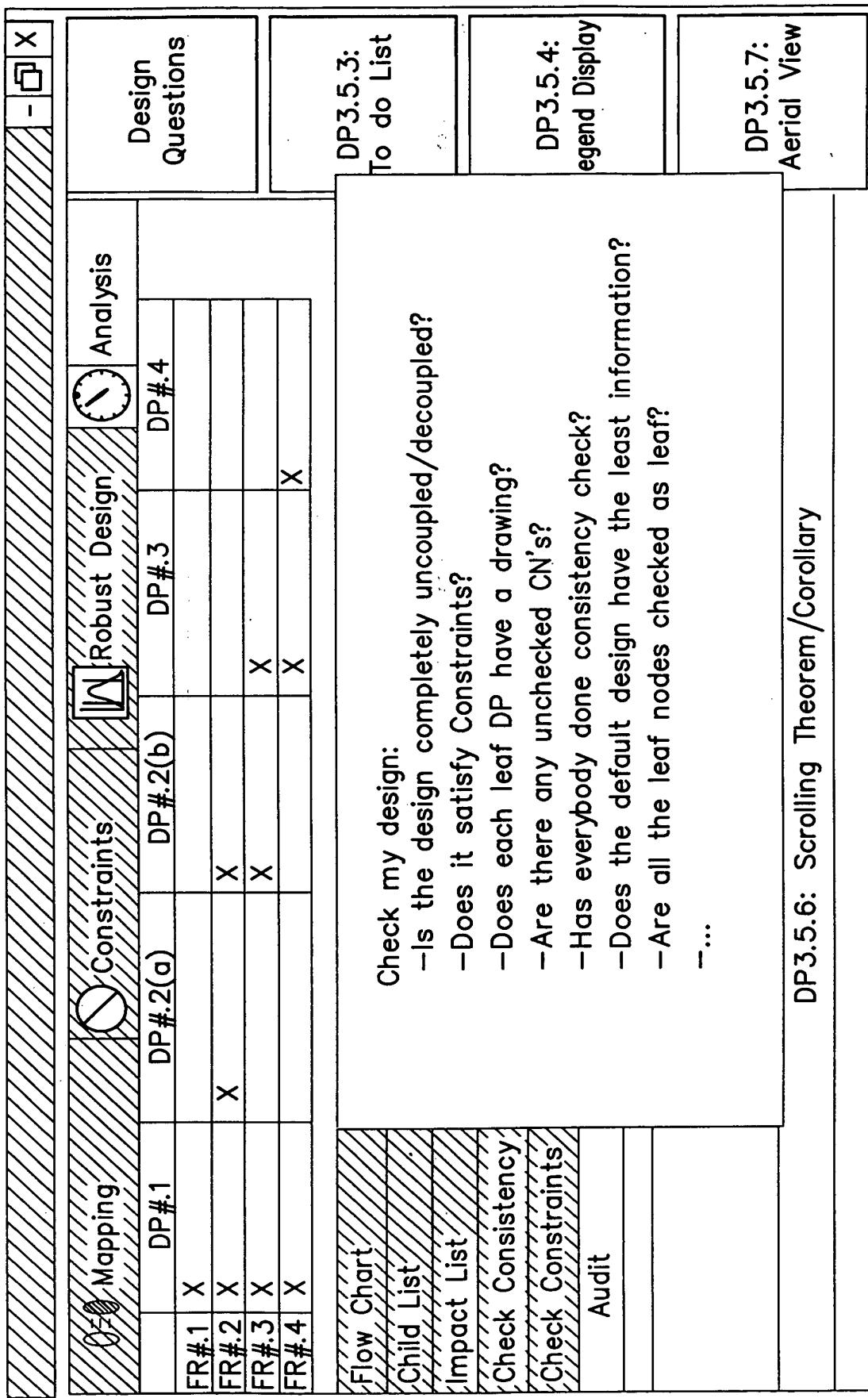


FIG. 80

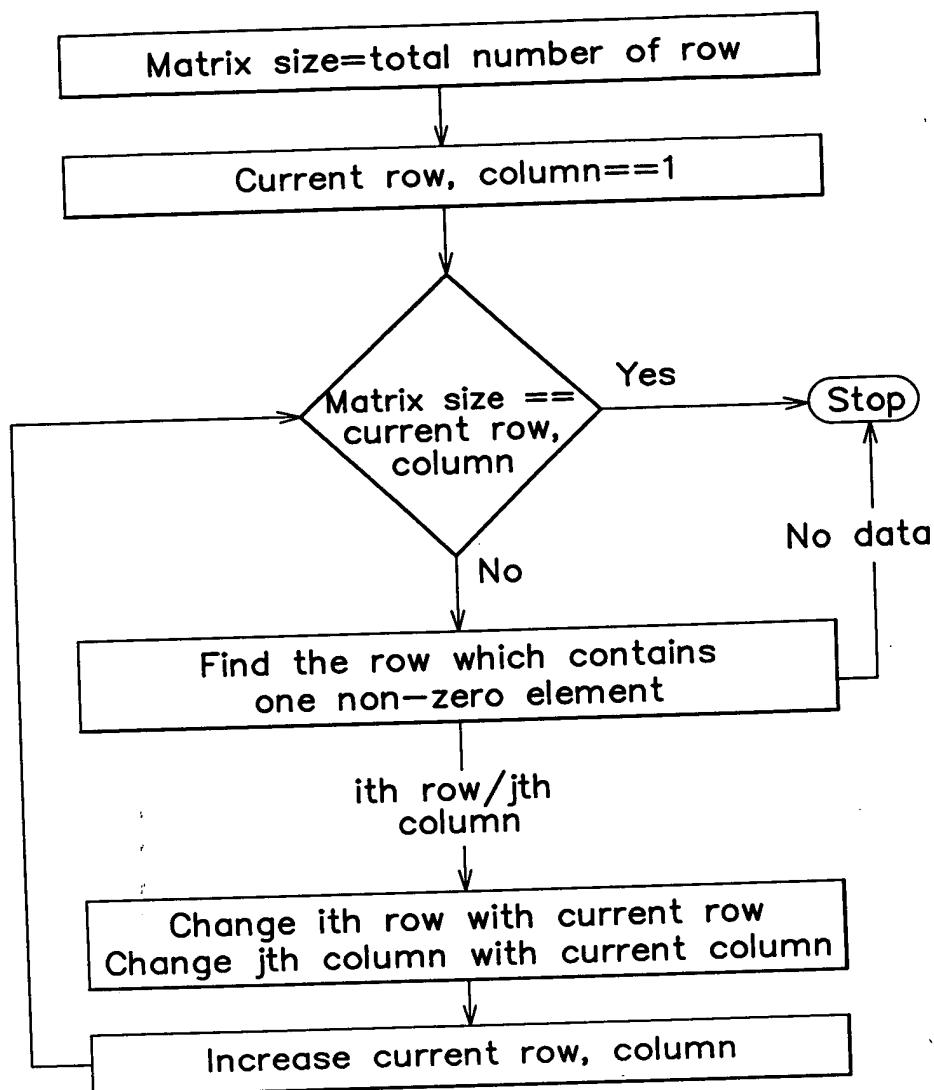


FIG. 81

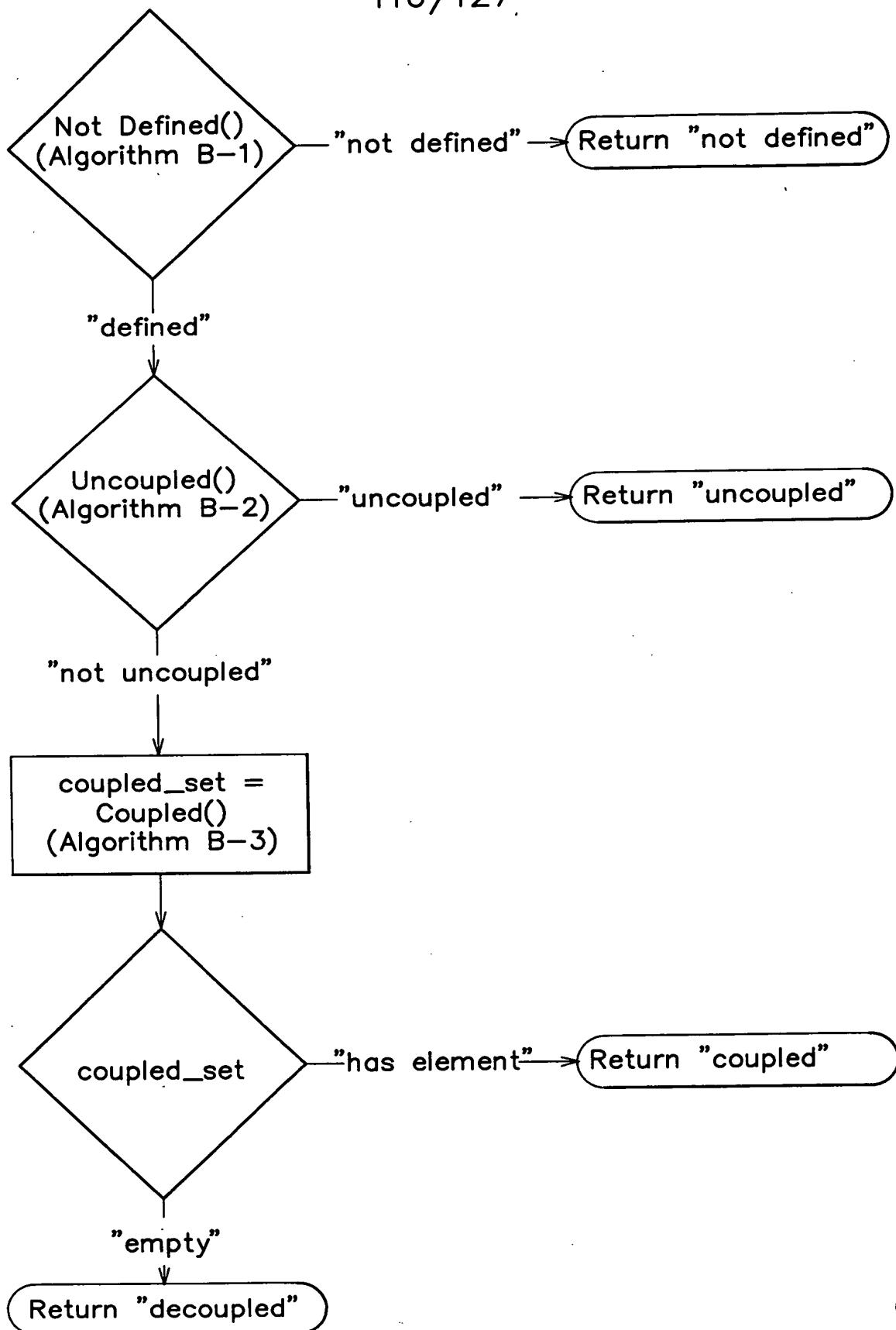


FIG. 82

```

Loop One (int row=0; row<total_row_number; row++) {
  Loop Two (int column=0; column <total_column_number; column++) {
    If(maxtrix[row][column] == "empty")
      return "not defined"

    If(row == column) {
      If(matrix[row][column] == "O")
        return "not defined"
    }
  }
  return "defined"
}

```

If one of the diagonal element has "0", the design is not defined in terms of the axiomatic design viewpoint

FIG. 83

```

Loop One (int row=0; row<total_row_number; row++) {
  Loop Two (int column=0; column <total_column_number; column++) {
    If(row != column) {
      If(matrix[row][column] == "X")
        return "not uncoupled"
    }
  }
  return "uncoupled"
}

```

FIG. 84

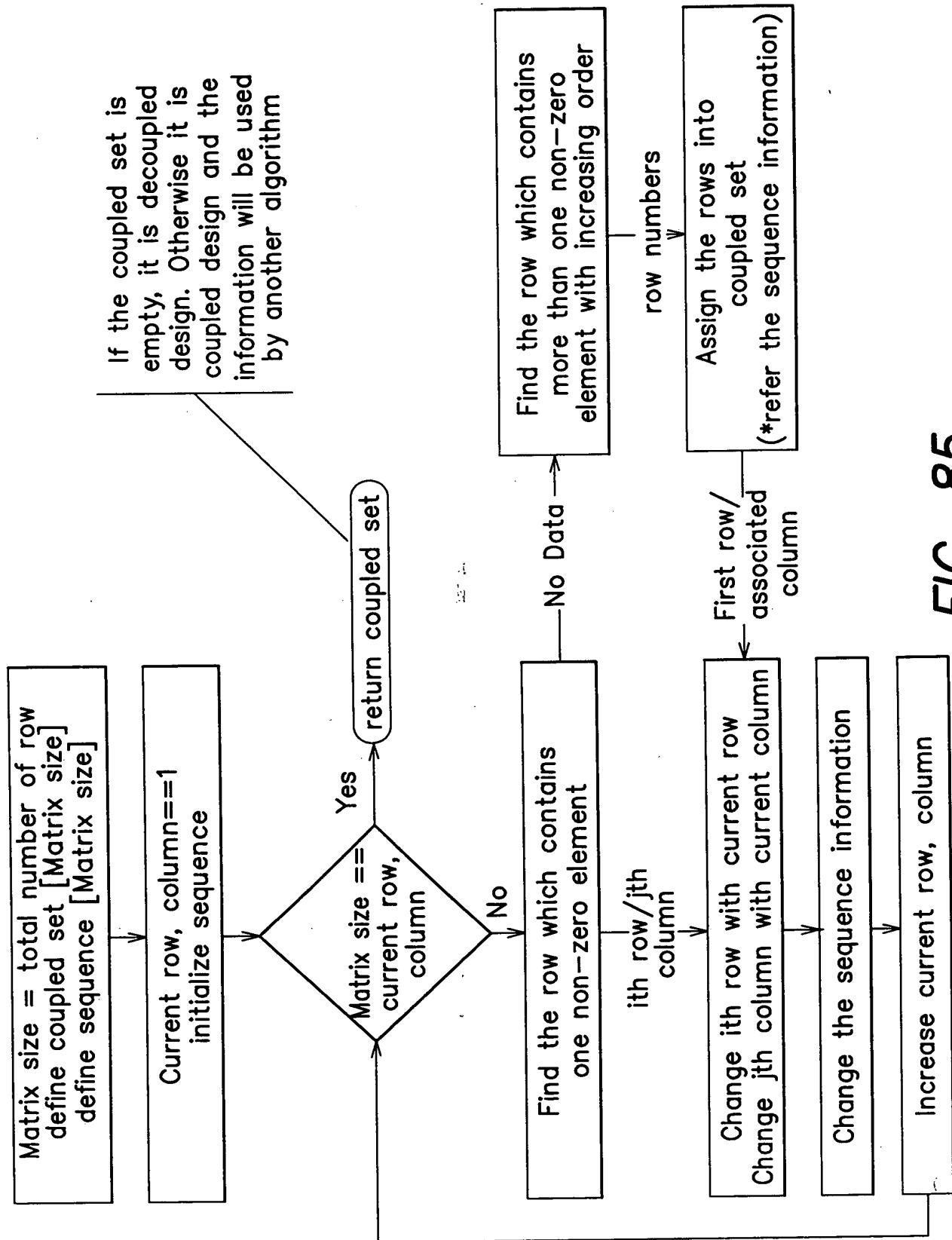


FIG. 85

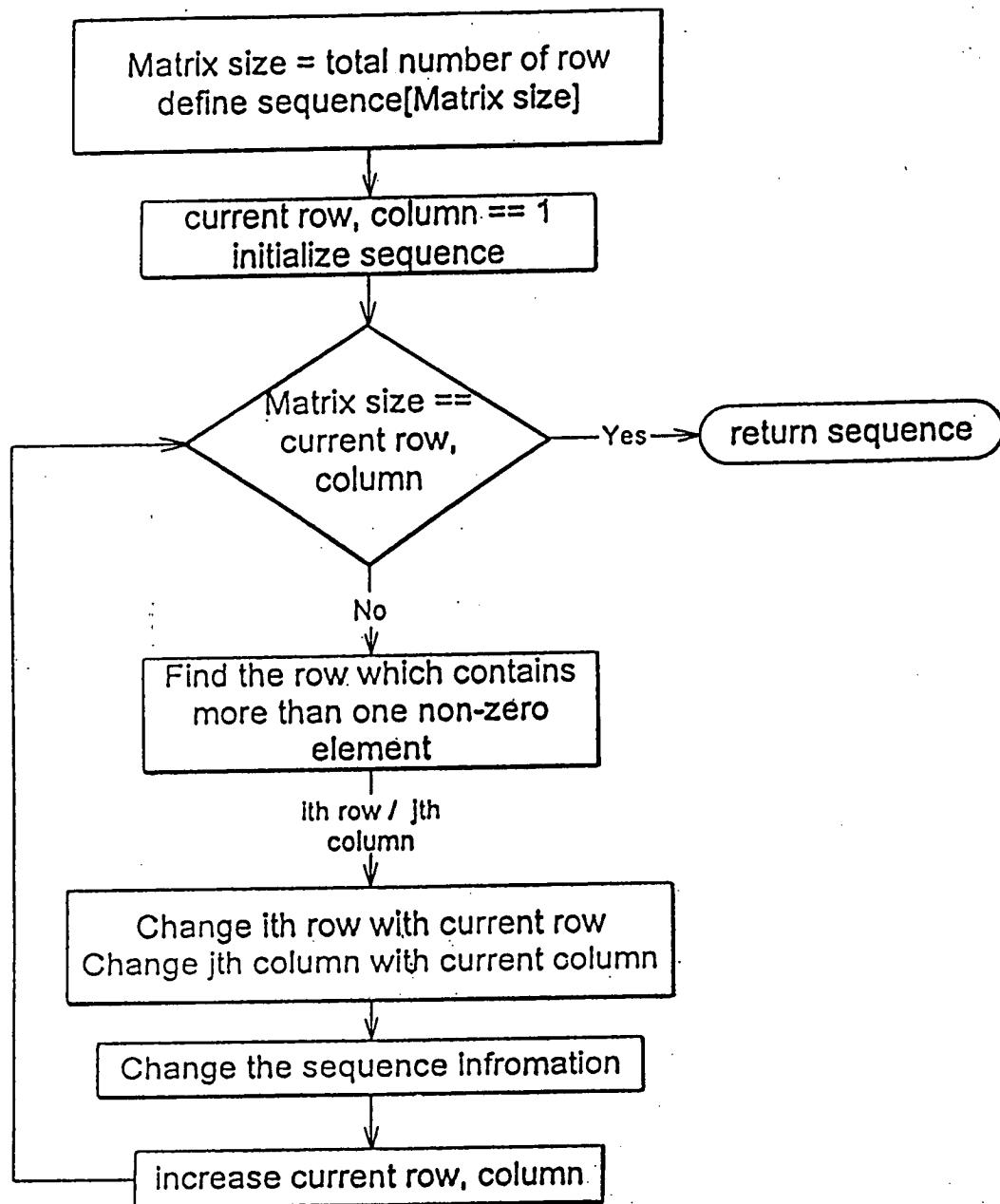


FIG. 86

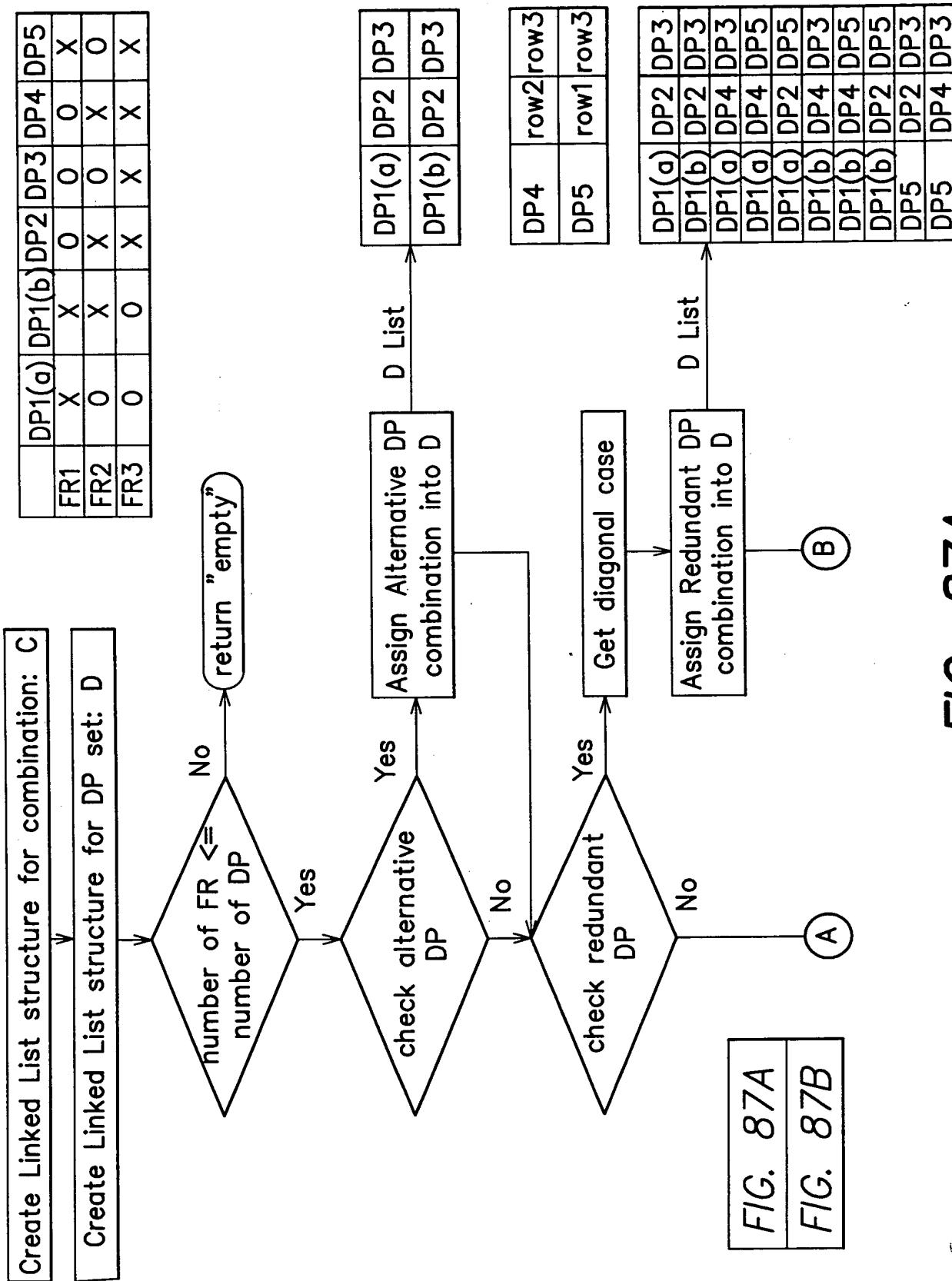


FIG. 87A

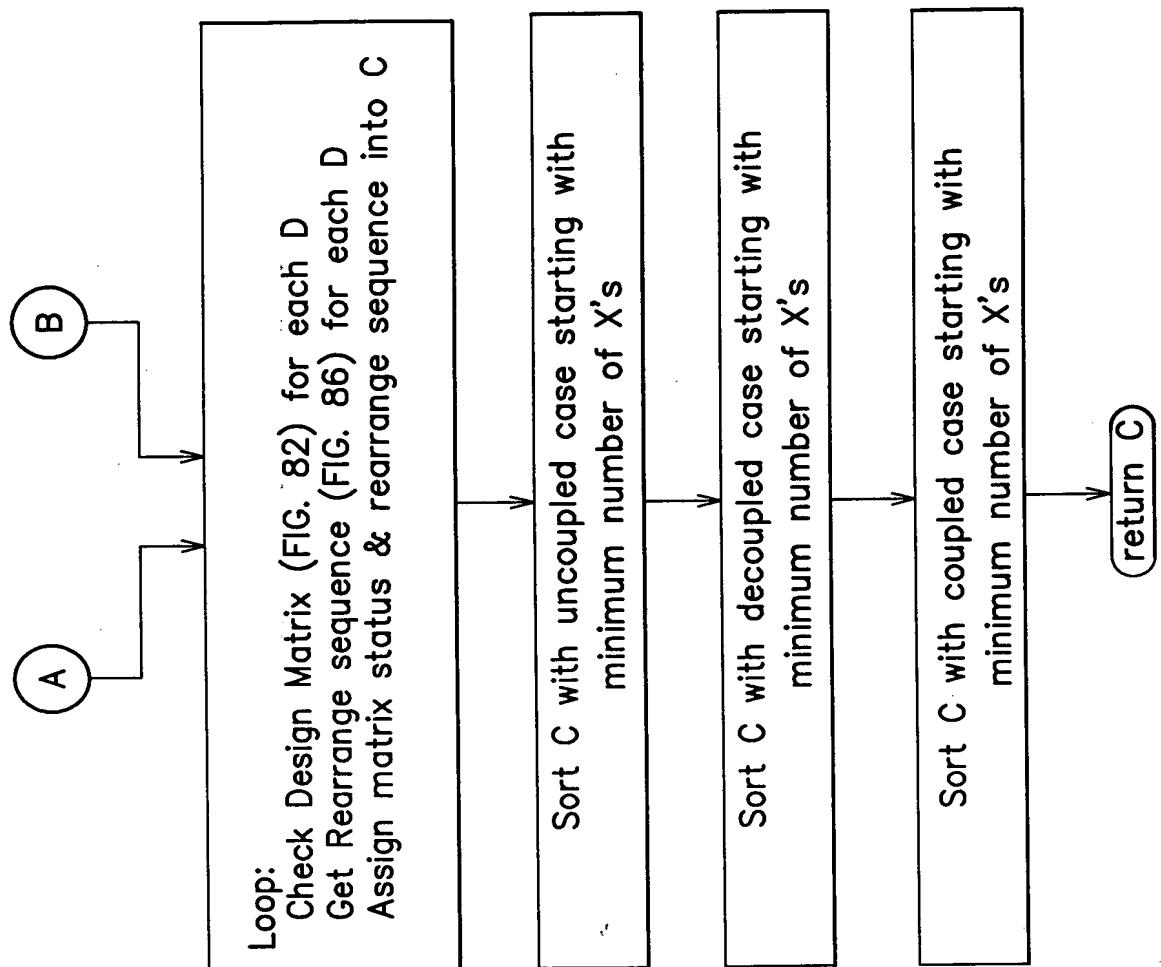


FIG. 87B

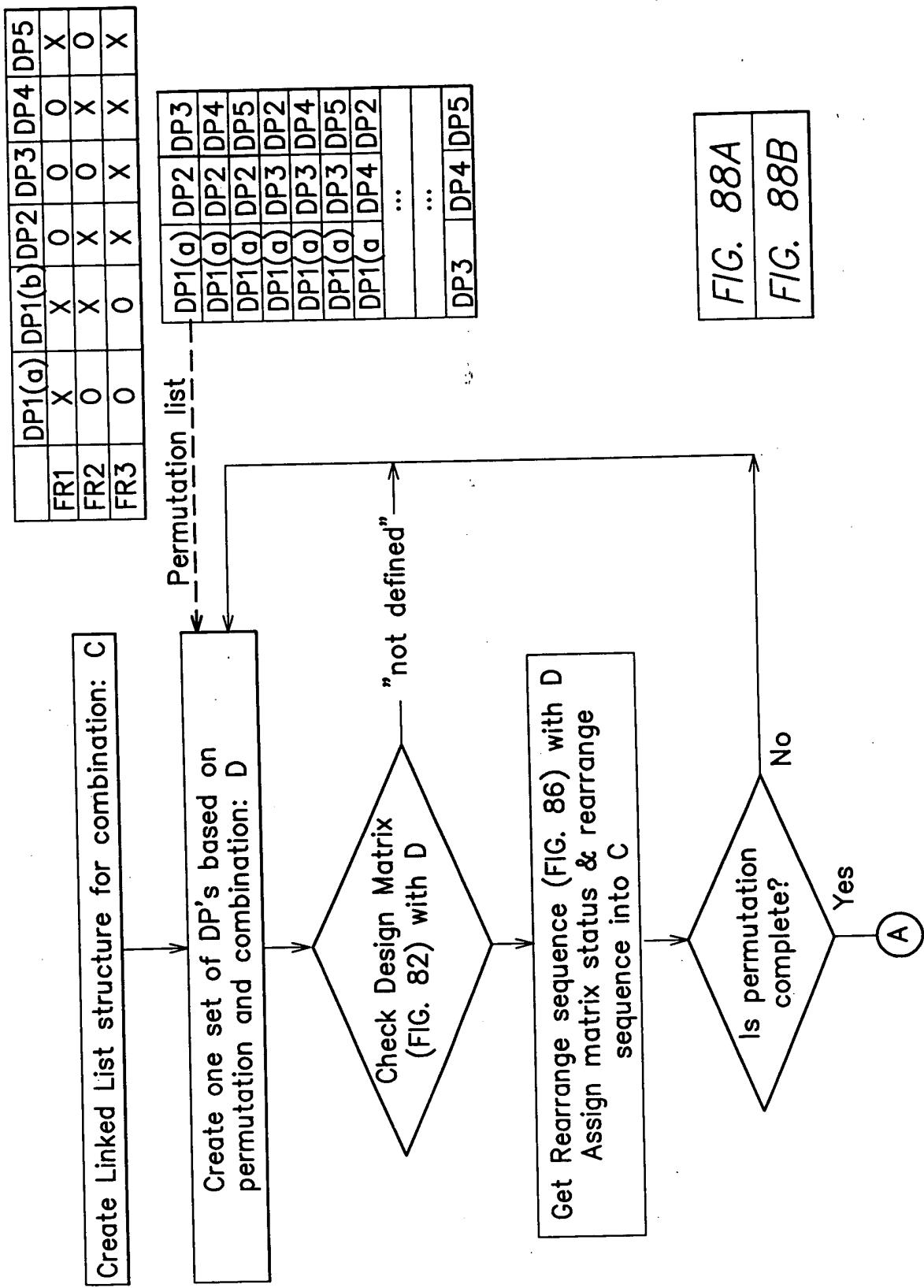


FIG. 88A

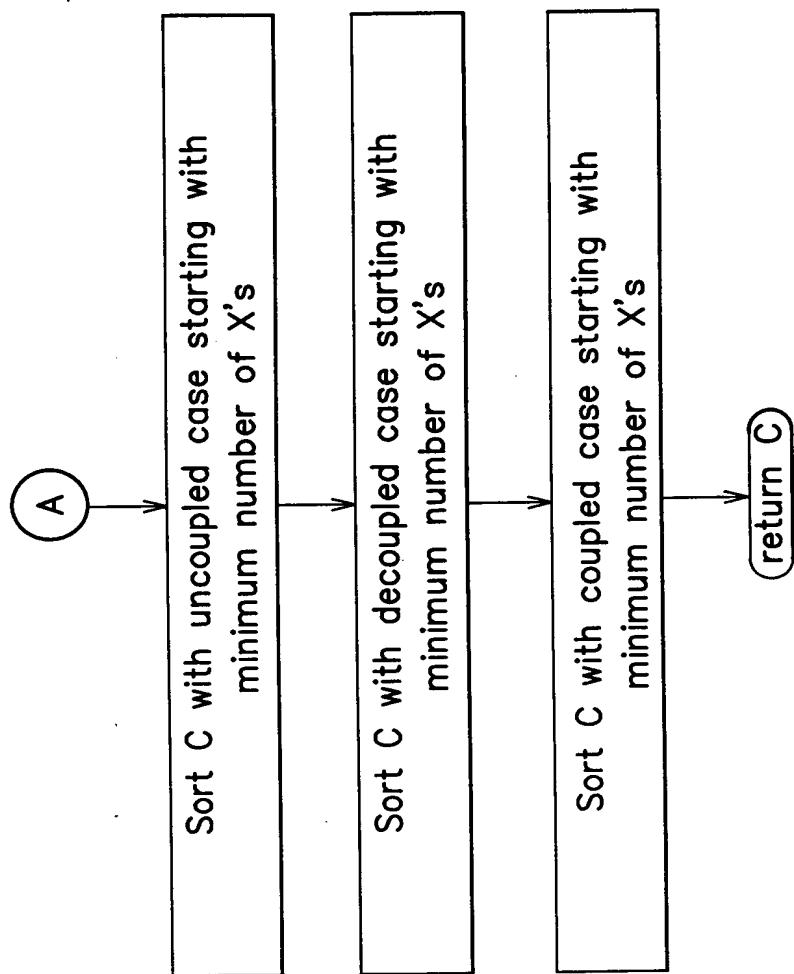


FIG. 88B

Create Linked List structure for node: N

N: fr_number

sequence = Rearrange Design Matrix
(FIG. 86)

N: 1, 2, 3, 4 ...

Initialize N with sequence

Create Linked List structure for edge: E

Check Design Matrix
(FIG. 82)
using rearranged
matrix

"not defined" \Rightarrow return "empty"

Is
Uncoupled?

Assign uncoupled
set into E

E: 1, 0, uncoupled
E: 2, 0, uncoupled
E: 3, 0, uncoupled
E: 4, 0, uncoupled

No

Is
Coupled?

coupled set =
Coupled()
(FIG. 85)

ex: 1, 3

No

Assign coupled
set into E

E: 1, 3, coupled

Loop:
Get decoupled/uncoupled set for each row
Assign decoupled/uncoupled set into E

E: 1, 2, decoupled
E: 2, 3, decoupled
E: 3, 4, decoupled
....

Create flowchart matrix using E

return flowchart matrix

FIG. 89

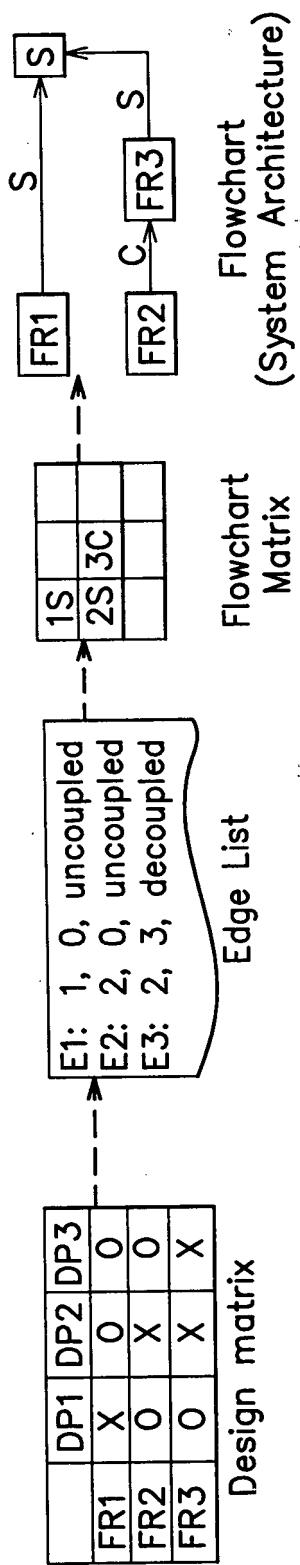


FIG. 90

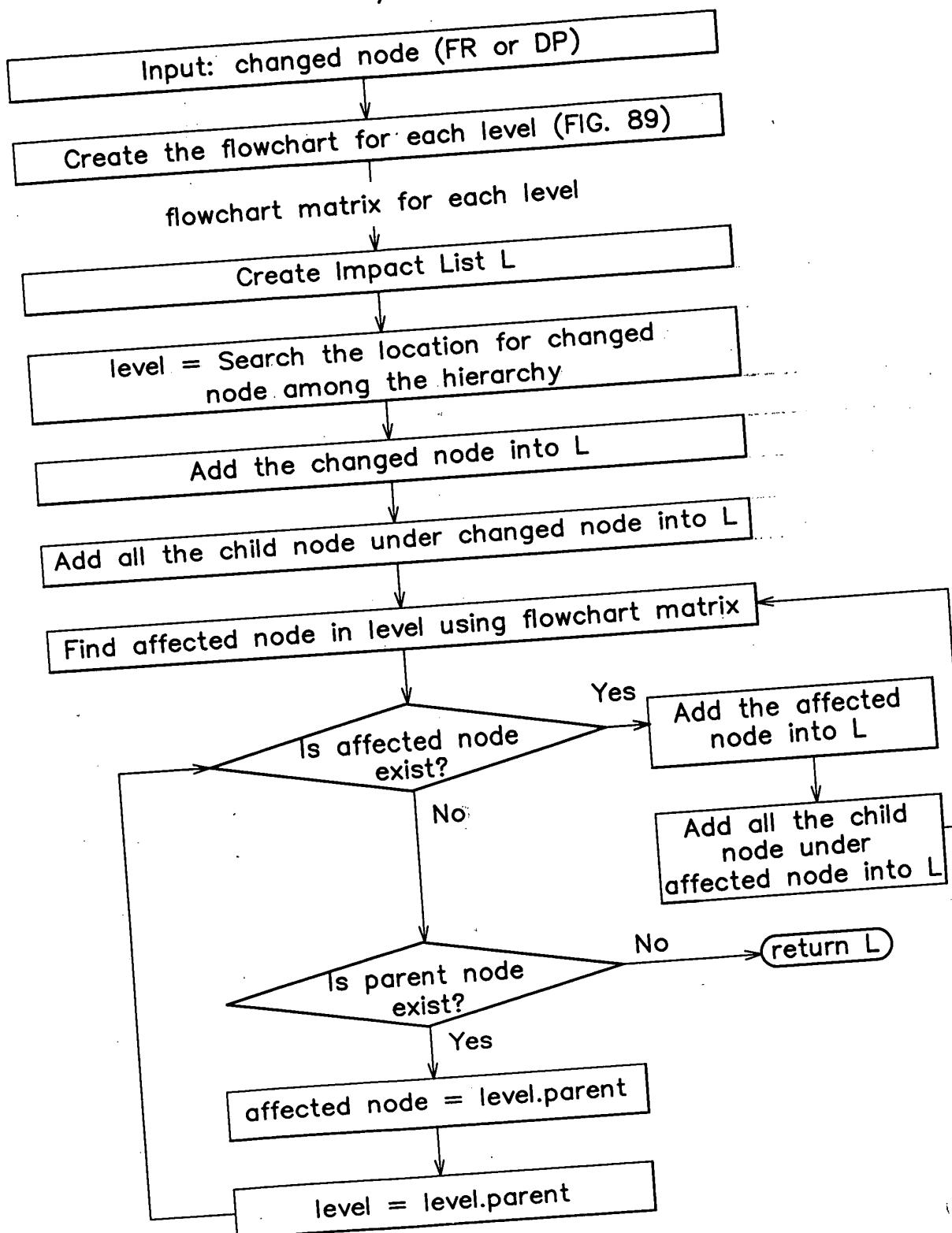


FIG. 91

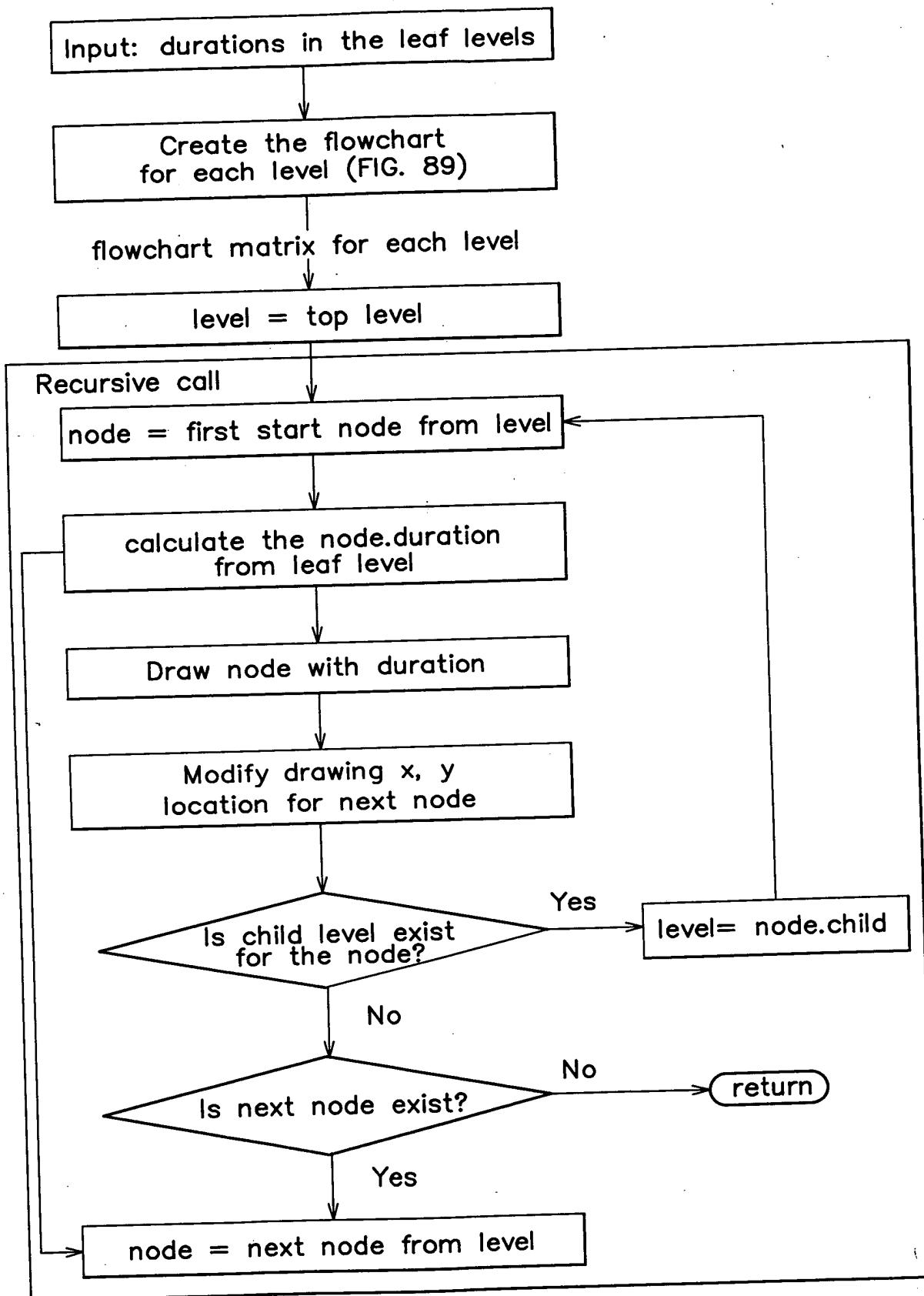


FIG. 92